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CALIFORNIA HIGHWAYS

OFFICIAL PUBLICATION OF THE CALIFORNIA HIGHWAY COMMISSION

Vol. 1 MAY, 1924 No. 5

HEADQUARTERS SHOPS, SACRAMENTO, UNDER JURISDICTION OF THE EQUIPMENT DEPARTMENT.—Upper, view of the office and portion of main shop building, from Thirty-fourth street. Center, an interior view of the shop; and, at bottom, view from the Stockton Boulevard, showing lawn and shade trees.

EQUIPMENT DEPARTMENT NUMBER

California Highway Department

California Highway Commission

HARVEY M. TOY, Chairman, San Francisco

N. T. EDWARDS, Commissioner, Orange — LOUIS EVERDING, Commissioner, Arcata

R. M. MORTON, State Highway Engineer, Sacramento

PAUL F. FRATESSA, Attorney, San Francisco — W. F. MIXON, Secretary, Woodland

---

Headquarters Staff, Sacramento

T. E. STANTON, Assistant State Highway Engineer

FRED J. GRUMM, Office Engineer in Charge of Surveys and Plans

C. S. POPE, Construction Engineer

HARLAN D. MILLER, Acting Bridge Engineer

R. H. STALNAKER, Equipment Engineer

A. J. WAGNER, Maintenance Engineer

LOWELL R. SMITH, Purchasing Agent

HERMAN B. WEAVER, Chief Accountant

Division Engineers and Headquarters

T. A. BEDFORD, Division I, Willits

H. S. COMLY (Acting), Division II, Dunsmuir

G. R. WINSLOW, Division III, Sacramento

J. H. SKEGGS, Division IV, San Francisco

L. H. GIBSON, Division V, San Luis Obispo

J. B. WOODSON, Division VI, Fresno

S. V. CORTELYOU, Division VII, Los Angeles

E. Q. SULLIVAN (Acting), Division VIII, San Bernardino

F. G. SOMNER, Division IX, Bishop

J. C. McLEOD (Acting), Division X, Sacramento

General Headquarters, Fifth Floor, Forum Building, Sacramento

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EQUIPMENT DEPARTMENT FUNCTIONS OUTLINED

ENGINEER TELLS OF WORK OF HEADQUARTERS SHOP

By R. H. Stalnaker, Equipment Engineer.

ONE of the striking developments in highway building during recent years has been the remarkable increase in the use of machinery and specialized tools. With this change in methods of construction and maintenance, the problem of properly equipping a department or an outfit, to do necessary work in connection with highway building to the best advantage and at the least cost, has become increasingly complex.

R. H. Stalnaker

It is the function of the equipment department of the California Highway Commission to handle all questions relating to the purchase, use, and care of equipment employed in road construction operations throughout the state, including the repair and distribution of surplus government war material.

UPKEEP DISTRIBUTION VEXING

In connection with these duties, one of the vexing problems which has confronted the department in the past, was that of a just distribution of the cost of upkeep of equipment against the work on which it had been used. For example, a truck might be in operation a year or more on numerous jobs, and possibly in two or three divisions, before reaching a point where it required a thorough overhauling.

Theoretically, the cost of overhauling should be prorated against the several jobs on which it was employed, but the task was almost impossible, as each man who had used the truck would insist that it was in first-class condition when it was in his hands and that the cost should be charged to the others.

RENTAL SYSTEM INAUGURATED.

In order to minimize these difficulties and to provide for proper depreciation charges, as well as to comply with the law passed by the last legislature, requiring that a charge for depreciation of equipment be levied against all work performed by day labor, all state highway equipment has been placed on a rental basis.

Rentals are so fixed as to cover, on an average, the cost of repairs and upkeep and an allowance for depreciation based upon the estimated life of the equipment. This system was put into effect January 1st of this year, and so far has succeeded beyond expectations.

ADMINISTERED FROM SACRAMENTO.

As previously stated, the headquarters shop is located at Sacramento where the equipment engineer and his immediate assistants make their headquarters, from which general administration of the department is conducted.

The Sacramento shop has been pronounced one of the best equipped for its line of work on the Pacific coast. At the present time, the organization is divided, broadly, into three departments—office and clerical, stores, and shop. About 110 persons are employed in the shop operations and the average weekly payroll is approximately $3,200.

Superintendents of equipment have been appointed in several of the divisions to have charge, under the direction of division engineers, of equipment in the divisions. It is hoped, similar appointments will be made in the remaining divisions within the next few months.

$7,000,000 IN WAR SUPPLIES.

The distribution of surplus war equipment for use in highway construction has been of great benefit to the state and the several counties. Up to the present time, equipment and supplies, originally costing the federal government in the neighborhood of $7,000,000, have been allotted to California.

An enumeration of this material, which is received by the equipment department upon behalf of the state, would read like a mail order catalog. Briefly, California has received about 1200 motor vehicles, thirty tractors, several carloads of picks and shovels, practically all the machine tools needed to equip the headquarters and division shops, several carloads of automobile and truck parts, and a large quantity of miscellaneous supplies and machinery.

Under the provisions of the acts of congress governing distribution of this material, about 300 trucks have been leased to the several counties of the state for use in their road building programs. In addition, we have been enabled to lease a limited quantity of machinery to some of the counties that operate repair shops.

SUPPLY ABOUT EXHAUSTED.

However, at the present time, additional trucks or supplies are not available for allotment to the counties. The California Highway Commission has few trucks in storage and these all will be placed in service on state work within the next few months. There is now pending in congress a measure providing for the distribution of additional war material, but unless this act becomes a law, it is doubtful if any additional equipment will be released to the states by the War Department.

Among the accomplishments of the headquarters shop, possibly the most interesting is the utilization of war material for purposes other than that for which it was designed. A striking example of this is the use we have made of Cadillac engines secured from the government.

(Continued on next page.)

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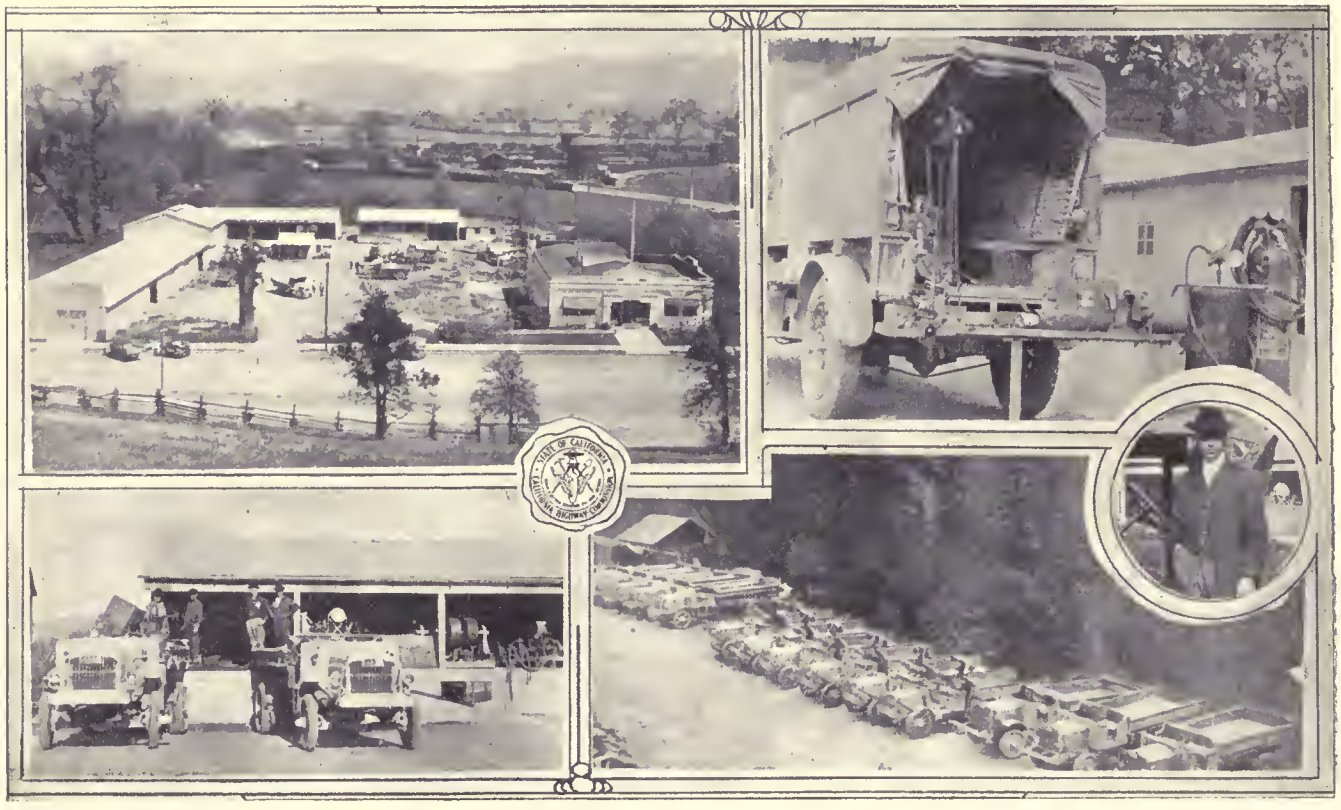


EQUIPMENT IN DIVISION I.—Upper left, general view of division office, shops, and storage yard at Willits. Upper right, fully equipped emergency service car for making repairs on the road. The rear platform becomes a work bench and folding cots save hotel bills. Lower left, loading platform, Willits yard; and, at right, fleet of trucks in service widening the Redwood highway. Inset, J. W. Grace, Superintendent of Equipment, Division I.

EQUIPMENT DEPARTMENT OUTLINED

(Continued from page 3.)

Just before the close of the war the ordnance department designed a 2½-ton caterpillar tractor capable of operation at high speed and driven by an eight-cylinder Cadillac engine. Only about seventy of these tractors were assembled previous to the armistice, but a large number of the eight-cylinder Cadillac engines had been delivered for use with these tractors.

MONEY SAVED FOR STATE.

The writer was successful in securing a number of these engines for California and, utilizing them, we have designed and built power plants for driving rock crushers, effecting a saving on each of between $1,500 and $2,000 over the cost of a commercial plant capable of performing the same work.

One make of truck distributed to us by the government was fitted with a pressure gasoline feed system which was a source of much annoyance and expense. We succeeded in securing from the government some 200 vacuum tanks, intended for use on tractors, and are installing these tanks on the above trucks whenever they come in for repairs. A considerable saving in the cost of repairs has been made possible by this change and so far the vacuum tanks have given no trouble whatever.

About a year ago, an 18-ton steam roller was sent into the shop for overhauling. Upon examination, it was found the boiler was in such a condition as to require a practical rebuilding. A considerable amount of work also was needed on the steam engine driving the roller. After some consultation, it was decided to alter this roller to a gasoline roller, and a 35 h.p., 4-cylinder gasoline engine, received from the government, was installed. The change has been a success and was made at less than the cost of the repair of the boiler and steam engine.

OTHER DEPARTMENTS AIDED.

Another interesting development of the headquarters shop is the department established to do repair work on automobiles belonging to other state departments located in Sacramento and vicinity. This department, installed some months ago at the suggestion of Mr. George G. Radcliff, chairman of the State Board of Control, is fully equipped to do efficient repair work in the shortest possible time and at minimum cost.

The steady increase in the volume of state highway construction in California, and need for a central agency to care for the large amount of surplus war equipment received from the federal government, have been reflected in the rapid development of the headquarters shop into an active, vital agency in the work of the state highway department.

The equipment department realizes its opportunity for service and is endeavoring to render that service as efficiently and economically as possible.

The Whitewater River bridge, in Riverside County, has been completed and opened to traffic.

The highway from Redding to the Oregon line is in splendid condition, it is reported by Earl Withycombe, who returned recently from an inspection trip in Division II.

GAS MASKS FOR TRUCKS

IN collaboration with the Division of Agricultural Engineering of the College of Agriculture at Davis, the Equipment Department of the California Highway Commission is now engaged in making an extensive test of air cleaners on trucks to determine, if possible, the relative merits of commercial air cleaners in such service.

It has long been known that much of the carbon in truck, tractor, and automobile engines is only dust which has gotten into the engine with the intake air, causing unnecessary and rapid wear of cylinders and pistons.

In 1922, Professor A. H. Hoffman, of the College of Agriculture, made a series of comprehensive tests of air cleaners, the first of its kinds ever attempted.

Before adopting air cleaners for highway trucks, it has been deemed advisable to make additional field tests of such equipment.

DIVISION I AIDS TEST.

Eight trucks, requisitioned by Division I for a widening and surfacing job on the Redwood Highway, near Cummings, have been selected for the tests, as they will be operated as one fleet under fairly uniform dust conditions.

Five of the trucks have been equipped with commercial air cleaners, and one with a special cleaner developed by Professor Hoffman. Two trucks will be operated without cleaners for purposes of comparison.

Both before and after the test the engines will be torn down and measurements taken of cylinder bores, piston diameters, ring widths and gaps, and crank pin diameters, and the weights of pistons and rings will be recorded.

During the test, records will be kept of mileage and gas and oil consumption and weekly samples will be taken of the crankcase oil for determination of dirt content and dilution. If the apparatus is available, it is intended to base the carburetor settings on exhaust gas analyses. Piezometer readings will be taken at carburetor intakes to determine any pressure losses which may result from clogging of the cleaners.

Valuable information is expected as a result of the tests.

TRUCKS REINFORCED FOR HEAVY STEAM SHOVEL WORK

TO prevent steel truck bodies from being sprung out of shape when used to haul rock in connection with heavy steam shovel operations, the Headquarters Shop has worked out a plan for reinforcing the bodies by use of heavy three inch oak planking, placed beneath the body in such a way that it acts as a sort of bumper.

Twenty-one three yard trucks recently have been turned out at the shop, fifteen of them being reinforced with the planking. All are equipped with underbody hydraulic hoists with a dumping angle of 48 degrees. This type of truck is doing a great deal to speed up handling of material.

Governors and air cleaners have been placed on Cadillac power plants operating rock crushers, making them particularly adapted for use where the load varies and there is considerable dust.

CADILLACS CRUSHING ROCK

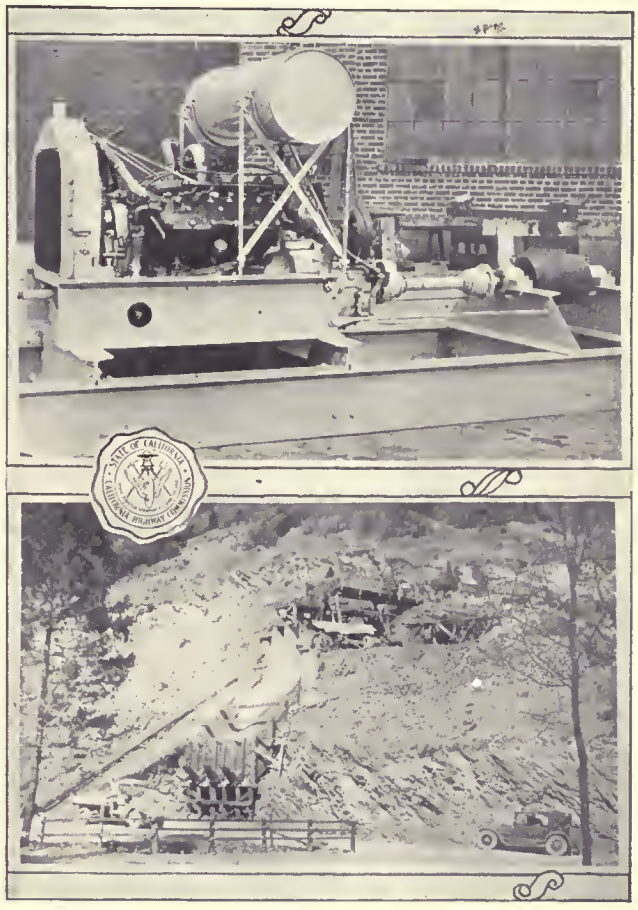
CADILLAC automobile engines, acquired by the government for war purposes, are now being used to crush rock for highway construction in California. This practical adaptation of surplus war material has been made possible by the rebuilding of the engines in the Sacramento shops of the highway commission.

Four power plants, using eight cylinder Cadillac motors, are now in service in the Sacramento Canyon, driving rock crushers for the production of road surfacing material.

CARLOAD SECURED.

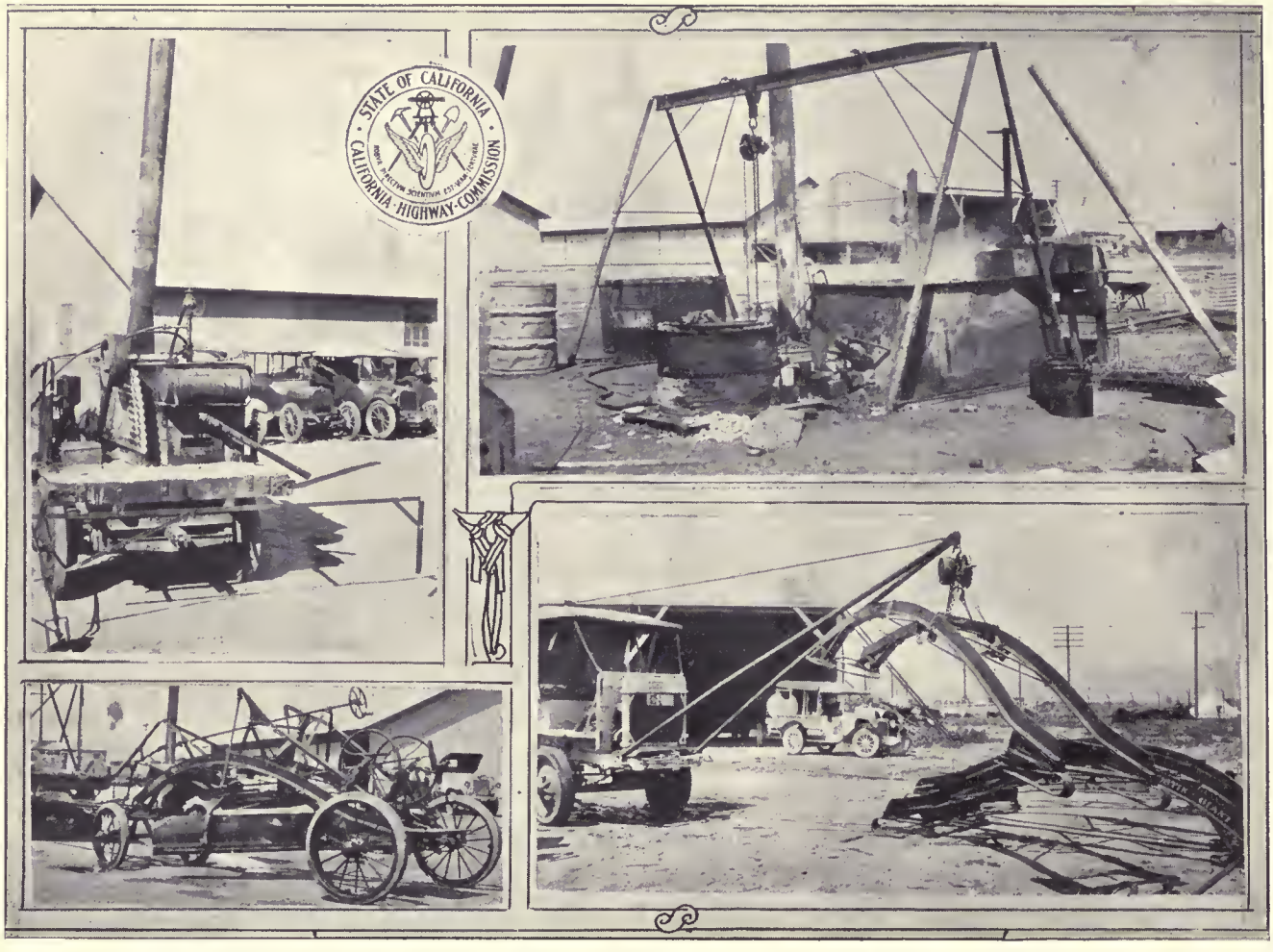
During his recent trip east, R. H. Stalnaker, equipment engineer, was successful in securing a carload of Cadillac motors, radiators, and spare parts from government stock at the Rock Island arsenal.

By the use of this material, Mr. Stalnaker reports, he is able to turn out a very satisfactory power plant at an expense of about $550 per plant, including freight from the government arsenal. The Cadillac motors provide a better power plant than could be purchased in the open market for $2,000.



At top, power plant built at the headquarters shops, Sacramento, and equipped with a Cadillac automobile engine, obtained from surplus government war stocks. Below, rock crusher in the Sacramento canyon operated by the same engine for production of surfacing material.

Pending the elimination of grade crossings, the locomotive designers might at least replace the antiquated cow-catcher with some sort of automobile mit.—Boston *Herald*.



VIEWS AT THE LANKERSHIM YARDS, DIVISION VII—Upper left is an asphalt spraying plant assembled at the Lankershim shops for painting traffic guide lines in the center of concrete pavement. It is mounted on a trailer and hauled by a truck. The upper right is a vat for cleaning oil and grease from metal. It contains Oakite and is capable of accommodating a large truck engine. The view at the lower left shows a rubber-tired grader leaving the yard for service on the state highway; and, at the right, assembling of graders is under way.

RECENT PURCHASES OF EQUIPMENT TOTAL $480,000

PASSING on the purchase of new equipment, during the last sixteen months, has formed no small part of the activities of the Equipment Department. Since January 1, 1923, expenditures for road-building equipment have aggregated about $300,000, and those for motor vehicles over $180,000.

Nearly all the money expended for motor vehicles has been for the rehabilitating and equipping of trucks received from the United States government, and the purchase of passenger vehicles to replace those worn out in service. The purchase of construction equipment has covered a broad field, including a complete outfit for the convict camp engaged in the construction of the Yosemite lateral.

CAREFUL SELECTION NECESSARY.

Selection of equipment best adapted to particular highway work involves careful analysis not only of the machines themselves but of the work on which they are to be employed. In many cases, inspection trips have been made to view similar equipment in operation by contractors and others to acquire first hand knowledge of its possibilities.

Equipment purchased covers a wide range of road-building machinery, including tractors, power shovels, graders, air compressors for operation of drills, pneumatic drill sharpeners, bodies for power dump trucks equipped with hydraulic hoists, parts, and numerous small articles.

BRAVERY REWARDED

DIVISION IV is proud of Rodman John W. McNeely, who has been awarded a gold medal for his part in fighting fire during the conflagration which swept a considerable part of eastern Sonoma County during September, 1923.

J. W. McNeely

McNeely warned Mr. and Mrs. S. Bussing and family, of Kenwood, of the approaching fire and remained on watch at their home all night, taking them to a place of safety in his automobile in the morning.

Returning to the Bussing home, McNeely, surrounded by flames on all sides, remained all day fighting fire, and, with the aid of a companion, succeeded in saving the home although adjoining buildings were destroyed.

WHOLESALE PURCHASE OF GRADERS BRINGS SAVING

FOR ten years, previous to this spring, the highway commission has been purchasing graders in small lots as requests came in from the various divisions. The result has been that practically retail prices were paid and almost every grader on the market could be found in use on state highway work.

An investigation shows that graders used on shoulder work wear out faster from being pulled behind trucks to and from work than during the working period, as the steel wheels and plain wheel boxes will not stand up under even a moderate rate of speed. Experiments convinced the Equipment Department that rubber tires and roller bearing wheels on graders will obviate many of the difficulties encountered.

STANDARDIZE PURCHASES.

In an effort to systematize grader purchases, and to effect a saving by wholesale purchase, grader requirements for the year 1924 were analyzed and bids called for on thirty-four eight-foot graders equipped with rubber tires and roller bearings. Nearly every standard grader manufacturer in the United States joined in the bidding and there was a wide range of prices. A careful analysis of the bids was made and an order placed for the entire thirty-four graders with one of the largest grader manufacturers in the United States.

An apparent saving of about 15 per cent was made on the purchase, which totaled approximately $31,500.

In addition to rubber tires and ball bearings, other features of the graders which were taken into consideration include directness of draught, general sturdiness of construction, ease of operation and weight.

OTHERS GET YEAR'S TRIAL.

In order that the department may have the benefit of a year's experience with the machines as a guide in placing orders for the 1925 supply, several other graders were given careful consideration and a single grader of each of these makes purchased for purposes of trial and comparison.

QUARTER MILLION IN SHOPS

THE headquarters shop and maintenance yard, located at Thirty-fourth and R streets, Sacramento, cover approximately four acres and represent an investment of something over $250,000. This includes the cost of the laboratory building, which totaled $30,000, and the storage yards of Divisions Three and Ten.

Equipment for the shop in the way of machine tools, lathes and drills, received from the federal government, is not included in the investment of $250,000. Surplus war equipment in the way of power tools now in use is valued at approximately $30,000.

POWER SHOVELS ADDED TO STATE'S EQUIPMENT

AMONG large items of equipment purchased during the past sixteen months have been two steam shovels and eight gasoline power shovels, delivered to various construction jobs throughout the state by the Equipment Department. The two steam shovels are in service on the heavy rock work in the Merced River canyon on the Yosemite lateral and the gasoline shovels are in use in other convict camps and on grade widening jobs throughout the state.

Two are being used by convict labor camps in Del Norte County and others are working on the Redwood highway, on the Trinity lateral, in the vicinity of Lake Tahoe, in the State Redwood Park, on the Coast Route in Division V, and on the Ridge Route, Division VII.

The state's investment in these power shovels is approximately $110,000.

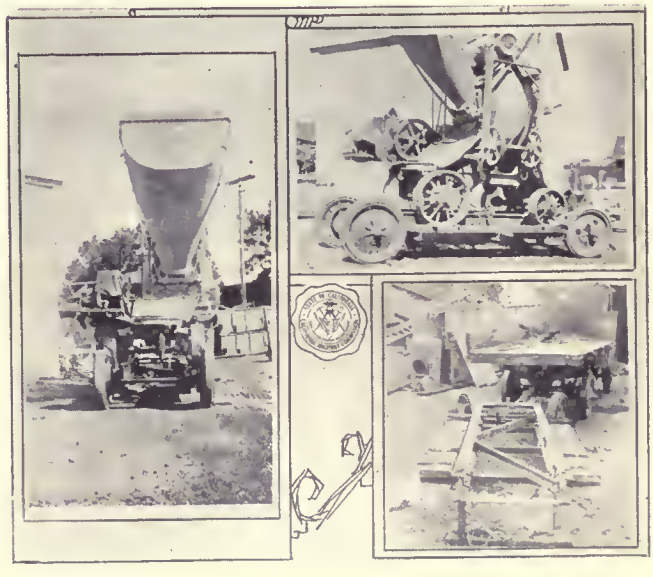
The advantage of this equipment in lower costs and greater speed is already apparent to the organization. Many favorable comments from the motoring public have reached commission headquarters, upon the widening of grades, and removal of dangerous points.

LIGHT TRACTORS PURCHASED

A RECENT outstanding development in methods of doing state highway maintenance work has been the widespread use of Fordson tractors for pulling drags, light graders, etc. Many of these have been equipped with a drag attachment, while others are used to pull ordinary drags and other equipment. Since January 1, 1923, the department has purchased forty Fordsons for this purpose. The Maintenance Department reports they are giving splendid service.

COMMITTEE OF NINE.

The Committee of Nine has completed its investigation of state highways in the lower San Joaquin Valley, three of the laterals between the San Joaquin Valley and the Coast highway and the latter route, south of King City. The next trip of the committee will include the San Francisco peninsula, the Pacheco Pass lateral and highways in the vicinity of Fresno.



Heavy duty trailer built from salvaged parts in the shops of Division VI at Fresno. It will carry eight tons and is low, doing away with the necessity for a loading platform.

SACRAMENTO HEADQUARTER

The headquarters repair shops and storage yard of the California Highway Commission at Sacramento represent an investment of $250,000 in buildings and e department, and warehouse. The lower left shows a corner of the truck repair department where 175 trucks were overhauled last year. A section of the shop ya the federal government. The insert at the left center, is a view in the trimming shop where all kinds of upholstering is done and automobile and truck tops repair

EQUIPMENT PERSONNEL

THE Equipment Department, one of the five major departments into which the headquarters administrative forces of the highway commission are divided, is under the direction of R. H. Stalnaker, equipment engineer. He is assisted by W. J. Gough, W. D. Cook, and F. W. McManus, as assistant equipment engineers. C. H. Ryon is chief clerk of the department.

The headquarters shop, which forms a division of the Equipment Department, also is under the general supervision of Mr. Stalnaker, assisted by the following staff:

F. E. Burnside, shop superintendent; C. H. Seavey, head of the store department; J. W. Coghill, office; A. D. Davis, foreman of the truck department; I. P. Johnson, foreman of the machine shop and heavy equipment section; and C. C. Warden, service department foreman.

HOPS AND EQUIPMENT DEPOT

nt and are rated as one of the largest and best truck repair depots on the Pacific Coast. The upper panorama is a view of the main shop building, office, yard, service hown at the lower center, while at the right is a view of the machine shop, showing the latest type labor-saving machine tools, obtained from surplus war stores of built. At the right, is a heavy duty trailer constructed at the shops for use on the state highways.

WHO GETS THE BULLETIN

CALIFORNIA Highways, official bulletin of the California Highway Commission, is published for the purpose of informing engineers and employees of the department and the public of the activities of the commission.

It is distributed without charge to commission employees, state officials, members of the legislature, county supervisors, chambers of commerce, and automobile clubs and associations, tax-supported libraries, contractors, newspapers and periodicals, to the highway departments of the various states, the Bureau of Public Roads and the Forest Service, the California delegation to congress, and to individuals who have evinced interest in the work of the commission.

Newspapers generally are welcome to make whatever quotations they desire from matter in the bulletin. Cuts used are loaned upon request.

Above, State Highway Commission permanent maintenance station at Petaluma, Division IV. Below, before and after views in the San Joaquin Valley. The shack at the right is the home of a maintenance foreman before the policy of state-owned stations was adopted. (Note equipment stored in tents at rear.) At the lower left is a state-owned station with a neat cottage and permanent buildings to house equipment. Lower views taken in Division VI.

State Owned Maintenance Stations Bring Results

By J. B. Woodson, Division Engineer, Fresno.

THE public should know why the highway commission builds neat, five-room bungalows for certain employees of the maintenance forces, and here is the reason:

The investment brings home the bacon.

J. B. Woodson

When the maintenance of the state highway system started, back in 1913, it was customary to send a responsible man out from the division headquarters, occasionally to look over the road. He had authority to pick up a few laborers locally, and make necessary patches to the pavement, or borrow a county grader and slope up the shoulders.

In those days, the term "permanent highways" was quite popular, and it was not then conceded that much of an organization would be needed to maintain them; as the roads, when paved, it was argued, would be of little further worry.

"PATROLMEN" FIRST STEP.

The first step in establishing a regular maintenance force was the appointment of "patrolmen." A patrolman furnished his own motorcycle for transportation, but the state furnished his shovel. The patrolman soon found he would have to add a side car to his motorcycle to carry a sack of cement and a little rock, and sand.

From this step, it developed that a Ford touring car or light truck was necessary. With the increasing responsibilities and equipment, maintenance foremen were established on permanent assignments, each approximately thirty miles in length. The Ford was augmented with a five-ton truck, a grader, a small concrete mixer, an asphalt kettle and various tools, and the list of necessary equipment is still growing.

RESPONSIBILITY GROWS.

Individual responsibility grew more rapidly, with the ever increasing traffic, than the ability and experience of the men

in charge of respective assignments. Our foremen were men "worked up from the ranks" of contractors' laborers, mixer men, teamsters, etc.

When an apparently suitable man was found who would be satisfied to be stationed at a certain location, he was placed in charge of a section of highway and headquarters designated. Many of the towns, that became headquarters of the various foremen, afforded few or no suitable houses, and frequently an available house had a higher rental value than the maintenance man could afford.

The result was more or less of a "camping out" proposition. The foreman would secure a vacant lot or get a shack with a sizeable yard; then, with his personal belongings and family, he would get started. State equipment and materials were stored haphazardly in any place not occupied.

GOOD MEN WOULD NOT STAY.

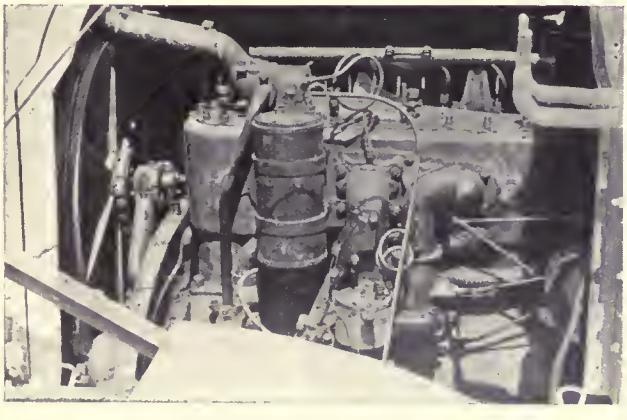
Under the above conditions, a good foreman could be kept in the service about six months. He would then move away to more desirable fields. In addition, he was hard to find or communicate with when off duty, and the state's valuable equipment, needed for the work, was at the mercy of thieves and fire.

Since inaugurating the state-owned foreman's cottage system, there has never been a resignation of a maintenance foreman in this division. This covers a period of ten years. In fact, a maintenance foreman's job is now hard to hold, and a fair ambition. Two civil service assistant resident engineers have been glad to receive appointments as maintenance foremen.

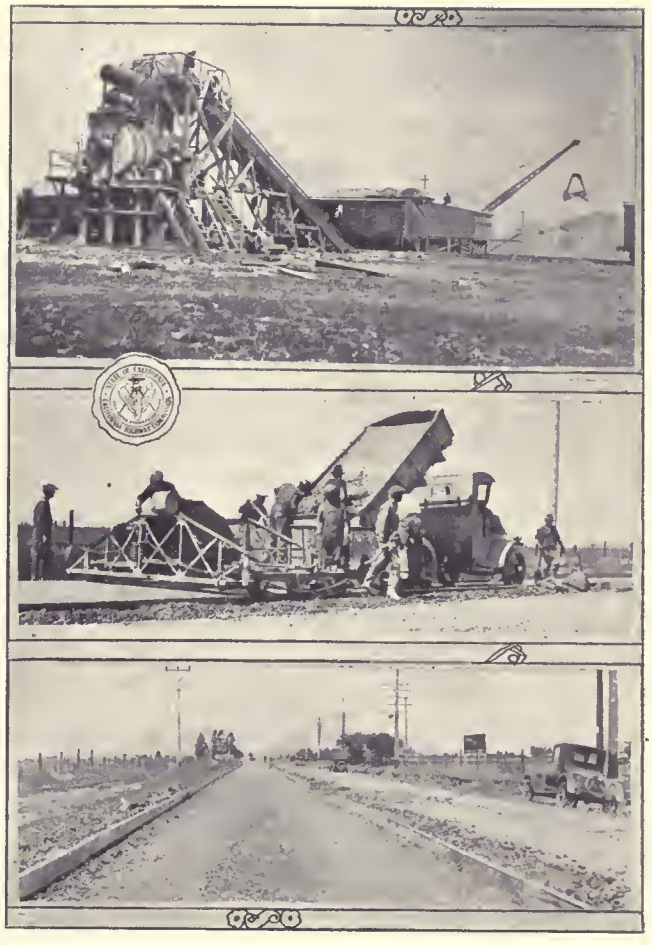
In Division VI, we have secured suitable maintenance yards and have built, to date, ten foremen's cottages, with more to follow as fast as funds are available.

These cottages will satisfactorily care for a family of five, and are periodically inspected, and kept in excellent condition. They cost approximately $2,500 each. The garage, storehouse, and heavy yard fence, which are a part of each station, cost $1,500 more. The average site costs about $750.

The maintenance foreman is proud of his station and proud of his job. And again I say, "the investment brings home the bacon."



Packard truck equipped with vacuum tank to improve gasoline feed. Work done at headquarters shops, Sacramento.



Central mixing plant and paving operations of the Kaiser Paving Company, Sacramento to Elk Grove contract, Division X. The lower view shows half of roadway ready for concrete. Note preparations for thickened outer edge.

SAND FOR SUB BASE

Particular attention is being paid to sub base on the Sacramento south paving contract, Division X. A thin cushion of sand, just enough to fill the voids in the rock sub base and bring the base to a perfect grade, is being used with results that more than justify the expense, it is reported by Division Engineer J. C. McLeod.

Experiments with calcium chloride in mixing and curing concrete pavement also are planned for this job in the near future.

Officers of the United States engaged in official business of the government are the only persons exempted from the gasoline tax in California, according to a statement by Controller Ray L. Riley, who warns against attempts by individuals to escape payment of the tax.

Allotments to dependents made by prisoners in the three prison road camps operated by the commission during April, totaled $1,535. Net earnings of the men in the camps for March were $5,048.40.

Mendocino County has advertised for bids for grading approximately three miles of the "MacDonald to the Sea" route, to be done at county expense.

COMMISSION JOINS HANDS WITH U. S. FOREST SERVICE FOR MUTUAL SUPPRESSION OF FOREST FIRES

WITH the most critical fire hazard period in the history of the state at hand, the California Highway Commission has joined hands with the United States Forest Service in an agreement for the mutual suppression of forest fires, originating along the state highways within the national forests where construction or maintenance activities are under way.

The understanding, designed to prevent misunderstandings in emergencies, was signed by Paul G. Redington, district forester, and representative of the commission.

TERMS OF AGREEMENT.

The highway commission agrees that:

1. In the case of fires for which the agents or construction contractors of the commission are responsible,

(a) Immediate action will be taken by the available personnel of the commission to suppress the fires,

(b) Responsible highway officers will report such fires to the nearest designated and agreed upon forest officer,

(c) The expenses for labor, supplies and equipment contributed by the commission in suppressing such fires will not be charged against the forest service.

2. In the case of fires for which the agents or employees of the commission are not responsible, originating within or reasonably adjacent to the rights of way of state highways within national forests, where construction or maintenance crews are maintained by the commission:

(a) Employees of the commission will be instructed to report such fires promptly to the nearest designated forest officer,

(b) Such fires will be handled by the available forces of the commission until the arrival of forest officers.

TO URGE LAW ENFORCEMENT.

3. Employees, agents and contractors of the Commission will be informed forcefully of and required to obey all of the state fire prevention laws through the issuance of written instructions to employees, and inclusion of appropriate clauses in such contracts as may be executed by contractors.

4. Proper fire warning signs, furnished by the forest service, will be posted at all camps established by the commission.

5. In large camps, an individual will be designated to act as fire chief, whose duties will be to see that the provisions of this agreement are carried out.

WILL DIRECT FIRE FIGHTING.

The forest service agrees that:

1. Designated forest officers will proceed upon notification of the commission or otherwise, to take charge of all fires occuring in or adjacent to rights of way or construction camps of the commission.

2. The designated forest officer will take charge of such fires unless notification is received that the fire which is being handled by the commission has been completely and properly suppressed.

3. All expenses for the suppression of such fires will be borne by the forest service at the current fire fighting rate for wages and equipment except as provided for in paragraph 1 (c) of this agreement.

SUBJECT TO CALL.

It is mutually agreed that:

1. All crews and employees of the commission, working within the national forests, shall be subject to the temporary call by Forest officers to suppress fires; such employees and crews to be released as soon as other fire fighting forces are available.

2. During the dangerous season from May 15th to October 31st, the employees or agents of the commission will secure brush burning permits from the nearest forest officer before proceeding with the disposal or burning of brush in connection with the operations of the commission.

ADJUTANT GENERAL PRAISES WORK TURNED OUT AT SHOPS

By R. E. MITTELSTAEDT, Adjutant General of California.

THE writer has had occasion, in recent weeks, to observe the work done at the headquarters shop of the California Highway Commission, in Sacramento. And upon behalf of the National Guard, I wish to express appreciation, not alone for the high type of service rendered the Guard, but for the economical and expeditious way in which the work has been turned out.

Several large motor trucks and a number of motorcycles, issued to the National Guard by the War Department and comprising a part of the Guard equipment, recently were overhauled and repaired in the shops of the commission. The Adjutant General's office is more than pleased with the work.

FUNDS SAVED FOR OTHER WORK.

This office was agreeably surprised when the bills came in. They were considerably lower than have been the charges for similar work in privately owned shops and mean a saving in funds of the National Guard, which can be devoted to other essential activities.

Lieutenant Colonel H. D. Coburn, an officer of the Regular Army, recently made an inspection of the commission's plant and equipment for repairing motor vehicles and he announced that he was highly pleased with what he saw there.

While your plant may not be the biggest, undoubtedly it is one of the best equipped on the Pacific coast for turning out work in a hurry. This brings to mind, the high potential value of the shops to the country at large in repairing military equipment in the event of future wars.

MAY MAKE BIG SAVING

Doc. Lichthardt, laboratory chemical engineer, has turned out a new material for filling piston scores, which, in many cases, may make the reboring of scored cylinders unnecessary. The saving resulting to the shop should be considerable from this one detail worked out by the laboratory, if it proves the success now indicated.

Equipment in the Divisions

EQUIPMENT in Division I is located at fourteen maintenance stations scattered throughout the division, and representing probably the most varied assortment of road building and maintenance equipment of any of the divisions. Scrapers, mule team outfits, steam shovels, drag line outfits, launches, tractors of all kinds, drags, dump trucks, rock crushers, sprinklers and numerous other pieces of equipment are included.

The division has two shops, one located at Willits and the other at Eureka. Twenty-six mechanics are employed.

A feature of the equipment in service is the completely equipped one-ton service truck which, in effect, moves the shop to the job. Equipment of the same make is kept on the same job, parts being interchangeable, and repairs thus facilitated.

Thirty-eight complete overhauls were made to equipment in Division I last year.

New Shops at Redding.

Ground has been broken at Redding for the new shops of Division II, a new site recently having been acquired for this purpose. The new yard covers approximately three acres and will be a big improvement over cramped conditions in the present shop.

Division II has about 170 motor vehicles in service, more than 100 of which are heavy trucks. New equipment recently added includes ten Fordson tractors for operation of drags. Twenty to thirty mechanics are employed.

Divisions III and X, because of their proximity to headquarters, do not maintain shops of their own. Storage yards, however, are located in Sacramento. A traveling inspector, whose duty it is to see that equipment is kept in good condition, is a feature of the work in Division III.

Three Shops in Division IV.

Due to its geographical location about San Francisco Bay, Division IV maintains three equipment depots at Petaluma, Fruitvale, and San Jose. Major repair jobs are done at Fruitvale where the main storage yard and shops are located, in charge of Foreman V. C. Smith.

The Fruitvale shops are now constructing four 165-gallon capacity oil heating and spreading units, mounted on trailers, and equipped with an underslung heating chamber capable of taking 110-gallon capacity drums. The initial heating of the oil will take place in the drums from which it will be pumped to the Georges Patcher kettles for final heating. Force pumps and spray nozzles are used for spreading the oil during patching operations.

Rental System Success.

Division IV reports the new rental system a success in that division. Studies indicate that the equipment of the division, including overhead and repairs, is being operated for approximately 50 per cent of the division's rental allowance.

The shops of Division V, located at San Luis Obispo, have developed from a small wooden shed, in 1918, to a first class shop building, 40 by 80 feet, truck storage warehouse, 40 by 108 feet, several additional buildings, and a foreman's cottage. The shop is well equipped with modern tools and with the yard covers an acre of ground.

New Shop for Fresno.

Negotiations are under way for the purchase of a new site for a division shop and storage yard for Division VI, at Fresno. The present yard is inadequate and a new location, where division offices eventually may be erected, has been found desirable.

E. S. Anderson is equipment superintendent of the division and Jesse Bain is shop foreman. Considerable notable work has been turned out by the Fresno shops in the past, including the construction of a heavy duty trailer from spare parts. This trailer is low, can carry eight tons, and does away with the need of a loading platform.

Division VII Proud of Lankershim.

Division VII is proud of the Lankershim shops and the work which is being done there. Plans are now being completed for a new and enlarged shop building to be constructed during the summer. Besides equipment for moving head walls in connection with lengthening of culverts, an interesting piece of equipment turned out at the Lankershim shops is a 14-S Lakewood mixer mounted on a heavy aviation chassis, making a paver with rubber tires, capable of being towed behind a truck at full speed.

Much surplus war equipment from southern California army posts was received at the Lankershim yard following the war. W. B. Cannon has been in charge of the shops since their establishment in 1917.

Site Purchased for Division VIII.

The commission has just completed the purchase of slightly over three acres in San Bernardino as a site for a future division shop and office building. It is hoped that the building of a shop may follow shortly.

The taking over of several hundred miles of desert roads for maintenance and the increased construction program under way in the southeastern counties have greatly increased the amount of equipment in use in Division VIII. Removal of equipment to the Lankershim shops for repairs entails much loss of time.

A useful piece of equipment in service in Division VIII is a rubber-tired trailer on which is mounted a large water tank for hauling water over long distances in the desert.

Start Made at Bishop.

Although only recently established, Division IX has a state-owned site and a small shop building in Bishop. The shop is limited in capacity and equipment but is serving the purpose for the time being and can be expanded as needed in the future.

CONVICT CAMP TRANSFERS

PLANS are being made to transfer a portion of the prison road camp, at work near the Klamath River, Del Norte County, to a new location on Smith River, between Crescent City and Grants Pass.

The commission also has announced that about July 1st, the convict camp, now located in western Shasta County, on the Trinity lateral, will be moved to a new location on the Walker Pass road, east of Bakersfield.

Both changes will transfer the camps from second to third bond issue roads. They have been made necessary by diminishing finances. As far as possible, the commission must now confine its activities to third bond issue roads, in order to comply with terms of the 1919 bond act.

SHOP DELIVERS SPRINKLERS

THE headquarters shop is just completing the delivery to the divisions of ten new sprinkler pump outfits. These sprinklers are equipped with 1,000 gallon tanks, mounted on Liberty trucks, and are used for sprinkling dirt roads and watering trees.

A labor-saving feature of the new sprinklers is a loading unit consisting of a 2½-inch centrifugal pump with a power take-off from the transmission. It is placed so as to insure efficient handling and filled the tanks in five minutes on test.

"The six wheel automobile is coming," says a motor expert. The average pedestrian is apathetic. By the time the two front wheels have passed over him he is past caring how many more there are.—London *Opinion*.

CALIFORNIA HIGHWAYS

OFFICIAL PUBLICATION OF THE

CALIFORNIA HIGHWAY COMMISSION

SACRAMENTO, CALIFORNIA

HARVEY M. TOY, Chairman;
N. T. EDWARDS and LOUIS EVERDING, Commissioners.

ROBERT M. MORTON, State Highway Engineer.

W. F. MIXON, Secretary.

We are pleased to permit publication of any of the matter contained herein and this privilege is extended newspapers and periodicals without restrictions.

FRANK B. DURKEE - - - Editor
P. O. Box 1103, Sacramento, California.

Vol. 1. MAY, 1924 No. 5

JUST AMONG OURSELVES

☆ ☆ ☆

HIGHWAY NEWS NOTES

Back on the Job.

DIVISION I is glad to announce that George W. Lane, construction superintendent in Mendocino County, has returned to his duties after a serious illness and operation.

J. W. Grace has completed his first year as superintendent of equipment in Division I.

Fred G. Grumm, headquarters engineer in charge of surveys and plans, and C. R. Blood, of the maintenance department, accompanied Division Engineer T. A. Bedford on an inspection tour of Division I recently.

Wedding at Dunsmuir.

Miss Madeline Bogard, clerk at Division II headquarters, Dunsmuir, surprised the office force recently by slipping around the corner to a nearby church where she was married to J. P. Kenealy, salesman for Crane and Company, Sacramento.

H. B. Williams, H. H. Bedolfe, and H. L. Darling, Division II draftsmen, have resigned.

E. L. Seitz, chief of party in the Sacramento Canyon, is bewailing the loss of a good cook, Mrs. Williams, who has resigned.

Division II recently had the pleasure of welcoming an old friend, T. A. Bedford, former division engineer at Dunsmuir.

Unhampered by regulations or epidemics of the foot and mouth disease, the April report from Division II declared reconstruction and maintenance of fishing tackle in full swing. The boys up north certainly had the advantage of those down on the desert and in many other parts of the state along about May 1st.

F. N. Hveem has been transferred from the convict camp in Trinity County to Lassen and Plumas where he will act as resident engineer on a surfacing contract.

R. B. Hayes has been transferred from Trinity County to the lower Sacramento Canyon as assistant resident engineer under E. J. Bassett.

"Lefty" Williams, pitcher, aided by the rooting of Mrs. Dan Wise, wife of Superintendent Brown's head timekeeper, won a 2 to 0 victory for the Weaverville highway team over the Dunsmuir town team recently. A big crowd of the Trinity fans came over for the game. The "Highways" also defeated Redding 20 to 0.

C. G. Barnett and his survey party have returned to work in northern Siskiyou County.

Honeymoon in South.

O. F. Georges, equipment inspector in Division III, recently joined the ranks of the benedicts by forming a partnership with Miss Nellie Knuckey, another employee of the commission. The honeymoon was spent in Los Angeles.

Another Wedding.

The wedding of William Howard Smith, assistant resident engineer, and Miss Eleanor Davies of Piedmont, took place in the Plymouth Congregational Church, Oakand, April 21st. Guests present numbered some 300. The couple will reside in Sonoma, where Mr. Smith is employed on the staff of Division IV.

Division Engineer J. H. Skeggs, Division IV, served on the civil service examining board during April and May, when examinations for positions in the classified engineering service were held at Sacramento, Dunsmuir, Willits, San Francisco, Fresno, San Luis Obispo, San Bernardino, Bishop, and Los Angeles.

H. A. Simard, assistant resident engineer, has been promoted from grade II to grade III, and has been assigned to the Bay Shore Highway as transitman.

Cigars Passed in Division V.

Cigars were passed at Division V headquarters recently, the occasion being the birth of Allen Thomas Marshall, 6½-pound son of Mr. and Mrs. L. G. Marshall. The proud father is assistant resident engineer at Big Sur, Monterey County.

B. W. Vinsonhaler, chief of party, has been detailed to the Monterey coast job, north of San Simeon, where he formerly had a great reputation as a fisherman. It is reported the fishes are safe this time as his attention has turned to radio.

Engineer Honored.

S. T. Corfield, assistant division engineer, Division VI, has been elected second vice president of the Fresno chapter of the American Association of Engineers.

B. W. Latour, former maintenance foreman in the Fresno district, has been appointed general foreman of all maintenance work north of Tulare.

P. L. Wilcox, assistant resident engineer at Lost Hills, has been promoted to resident engineer.

Harry Nelson, locating engineer on the Walker Pass road, Kern River Canyon, has resigned to be associated with H. T. Reupke in the contracting business.

Ransome Swallow has reported as instrumentman and George A. Green as rodman at Democrat Springs.

Division VII Engineer Promoted.

L. M. Ranson, with the California Highway Commission since 1913, has been promoted to the position of assistant division engineer in Division VII and is receiving the congratulations of many friends.

T. J. Driscoll has been assigned to duty as assistant engineer on the Hauser contract in Ventura County.

Arnold Richardson has been assigned to a similar position in connection with the Oswald contract on the Ventura boulevard.

Returns to Los Angeles.

Having completed the training of the office force in the new division headquarters at San Bernardino, Miss Eleanor Lyons has returned to her former position with Division VII at Los Angeles. San Bernardino reports Miss Lyons has been of great assistance in getting the work under way.

T. R. Goodwin, formerly with the Arizona Highway Commission, has been appointed resident engineer on the grading contract between the Sand Hills and Yuma, Division VIII.

Charles B. Ryon, of the headquarters equipment department at Sacramento, was a recent visitor to Division VIII.

L. D. Packard, resident engineer, is completing his final report following the completion of the Whitewater River bridge, in Riverside County.

The hoof and mouth quarantine caused the abandonment of a picnic planned by Division VIII for April 27th.

Transfers from South.

H. O. Ragan, recently with the Division VIII, will be resident engineer on the Vacaville to Batavia paving job which is expected to be under way soon, it is announced by Division X.

C. W. Springer is in the field making surveys as the head of a sort of "floating" survey party for Division X.

News from Headquarters.

Wives of a number of the headquarters engineers were hostesses to their husbands and a number of friends at a dancing

SMILEWAYS

Mixon's Desert Grave.

RACING across the desert during its inspection of highways in the south, the Committee of Nine, at the earnest solicitation of Secretary Mixon, stopped to gaze upon a lonely desert grave, the final resting place of some weary traveler of the days before automobiles. After backing up about a quarter of a mile, the "grave" turned out to be an old stove about which the sand had drifted.

He Swings a Wicked Stick.

Conflicting reports have reached the bulletin editor about the results of a recent golf match betwen Ed Araujo, Fred Grumm, and C. S. Pope. It appears that Ed made assertions concerning his ability with the clubs which the other two declare he failed to back up. He claims a cleanup.

DELICATELY NURTURED.

It was a hot day and seven cars were waiting their turn at a filling station. The last one was a steaming little 1915 Rattler, with six rattles and a button. Finally it got its turn (even a Detroit worm will turn) and the peevish attendant yelled:

"How many gallons?"

The driver of Lizzie held up one finger.

"Say," bellowed the attendant, "What are you tryin' to do? Wean it?" —*The American Legion Weekly.*

KNEW WHERE TO GO.

When the safe in the office of the district attorney of Trinity County refused to open, recently, and after about everyone in Weaverville had tried a hand at opening it, someone suggested getting an expert from the prison road camp at Greenhorn. Superintendent Brown sent up one of "the boys," accompanied by a guard, and the strong box was opened in less than five minutes.

CONSIDERATE.

"Would you mind driving a little slower, old man?"

"Not getting scared, are you?"

"Oh, no, nothing like that, but I'd hate to take an unfair advantage of my life insurance company."

Lady: "And you say you are an educated man?"

Weary Willie: "Yes, mum, I'm a roads scholar."

—*University of Michigan Gargoyle.*

The guy that put across, "To them that hath shall be given," must have referred to constables and magistrates who operate speed traps. —*Colorado Highways.*

MOSTLY BUNK.

Wifey (studying Spanish history): "It says here, George, that those Spanish Hidalgoes used to think nothing of going 2000 miles on a galleon."

Husband: "Pooh! I never believe half I hear about these foreign cars."

Stalled Motorist: "Can you give me a tow, old man?"

Passing Tourist: "No, but if you're really hungry, I'll give you a sandwich." —*Awgwan.*

NO EXCEPTION.

At Winterton a tourist called out to an aged colored person: "Say uncle, how far is it to Wellington?"

"Well, suh," answered the darky, "I kin scurcely say. It useter be 'bout twenty-five miles, but ev'ything's gone up, so I kinder reckon it's 'bout fohty now, suh." —*Country Gentlemen.*

It's easy enough to be pleasant,
When your automobile is in trim,
But the man worth while, is the man who can smile
When he has to ride back on the rim.

THANKFUL!

Blessings on thee, little dame,
Barebacked girl, with knees the same;
With thy rolled-down silken hose
And thy thin, transparent clothes,
With thy red lips reddened more,
Smeared with lipstick from the store;
With thy make-up on thy face,
And thy bobbed hair's jaunty grace.
From my heart I give thee joy,
Glad that I was born a boy!

Smith Tries Comeback.

Lowell Smith, our genial purchasing agent, became so worked up with the advent of the baseball season that he essayed a comeback on his home town sand lot in North Sacramento. However, he neglected to oil up the old joints and when he tried to pull a "Ty Cobb" slide to second, he pulled a tendon, instead. With the aid of a two-by-four roughed up for a walking stick, he hobbled about headquarters trying to convince the gang that he's just as good as he used to be.

The locomotive not only has the right of way, but can always prove it.

JUST AMONG OURSELVES

(Continued from page 14.)

party at the Sutter Lawn Tennis Club on the evening of May 10th.

R. H. Stalnaker, equipment engineer, and A. J. Wagner, head of the maintenance work, made an inspection of equipment and maintenance work in southern California recently.

C. L. McKesson, research engineer of the construction department, visited Division VIII recently for the purpose of inspecting and sampling the product of three cement mills in that district. While in the south, he also made studies of various types of pavement on the state system and the asphalt deposits near Carpinteria.

H. L. Mahoney reports the headquarters baseball team has disbanded because of lack of interest. The real fans seem to be in the prison road camps.

C. S. Pope, construction engineer, recently returned from Bishop where he inspected work under way and proposed.

The construction department claims first honors for a 100 per cent showing of straw hats.

Proud Daddy.

William Bock, assistant engineer in the headquarters drafting department, is the proud daddy of a son who arrived in Sacramento, May 8th.

MILLIKEN TELLS OF PRISON CAMPS.

The success of the new pay system in the prison road camps conducted by the state highway commission with convict labor is attracting unusual interest throughout the state. During recent weeks, Ben H. Milliken, superintendent of the camps for the commission, has accepted invitations to speak before the following organizations in San Francisco:

Down Town Association, Lions Club, Knights of Columbus, Electrical Development League, and the American Legion.

In Oakland, Mr. Milliken addressed the Soroptimist and the Kiwanis Clubs, and in Sacramento he has spoken before the Lions Club and the Knights of Columbus.

Traffic in recent weeks came almost to a standstill over the interstate connections of Division VIII due to the hoof and mouth epidemic quarantine.

During early weeks of April, Maintenance Foremen L. H. Lucas and E. C. Foust pulled about 200 automobiles through the snow on the Crest Route, San Bernardino County, the late storm closing the road for the first time during the winter season.

BEFORE AND AFTER VIEWS IN GAVIOTA CANYON

WIDENING CURVES ON THE COAST HIGHWAY, NORTH OF SANTA BARBARA, DIVISION V.—The six upper views show before and after scenes in Gaviota Canyon. The tree at the left of the upper views indicates the amount of yardage moved. Views at the bottom show the power shovel and trucks operated by state forces engaged in widening operations south of Gaviota. An additional $25,000 has been voted by the commission to continue the work.

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CALIFORNIA HIGHWAYS

OFFICIAL PUBLICATION OF THE CALIFORNIA HIGHWAY COMMISSION

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PRISON ROAD CAMPS OF THE CALIFORNIA HIGHWAY COMMISSION—Upper left, Briceburg Camp on the Merced River, Yosemite lateral; center, Greenhorn Camp in western Shasta County, Trinity lateral; lower left, Requa Camp on the Redwood highway, southern Del Norte County; lower right, convicts on the Trinity lateral preparing a blast on the partly completed grade; and upper right, after the blast.

In this issue: BUILDING HIGHWAYS WITH PRISON LABOR.

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N. T. EDWARDS, Commissioner, Orange — LOUIS EVERDING, Commissioner, Arcata

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PAUL F. FRATESSA, Attorney, San Francisco — W. F. MIXON, Secretary, Woodland

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JUNE 1924

California Highways

VOL. 1 No. 6

TEN MONTHS OF CONVICT PAY LAW REVIEWED

STATE LEADS IN USE OF PRISON LABOR ON ROADS

CALIFORNIA, leader of the nation in many things, is again to the front with one of the most interesting experiments in criminology in recent years—payment of a small wage to convicts from the state prisons employed in the construction of state highways.

While the employment of prison labor in state highway construction in California is not new, dating back to 1915, the granting of compensation is an authorization of the legislature of 1923. The present law has been in force since August, of last year, and is believed to be the first of its kind enacted in the United States.

Ten months under the new law has revitalized prison camp road work in California, and has attracted widespread interest upon the part of the public as well as those giving study to the problem of crime and criminals.

NO EXTRA COST TO STATE.

Since the new pay law went into effect, some 850 men have gone through the three camps, now in operation, and have made net earnings of approximately $34,000. Of this sum, $5,000 has been alloted to dependents.

This has been done without any extra cost to the state highway commission as the cost of operating the camps is no greater now than prior to the passage of the pay law, the money earned by the men representing economies effected in camp operation and management under the new plan.

The law provides that the commission may pay the men a maximum of $2.50 per day. Studies showed that it was costing the commission $2.10 a day to keep the men at work under the former law and this figure was set as the wage to be paid.

Against this daily wage of $2.10 the law directs the commission to charge the cost of transportation, meals, clothing, medical and dental care, camp management, guarding, payment of rewards, and the cost of small tools. When this has been deducted, the prisoner is permitted to retain a maximum of 75 cents per day, provided he can save that much. A review of camp reports indicates that many of the prisoners are making the maximum permissible under the law. In recent weeks, the average earning has been on the increase and is now around 50 cents a day.

Every man starts out obligated to the commission. Upon his arrival in camp, he is advanced an outfit of clothing, bedding, etc. This starts him off $30 to $40 in debt. If he is industrious, he gradually cuts down his indebtedness and begins to pile up a surplus which is his when he is discharged or paroled. He is expected to do this within a period of three months, but a considerable number do so in less time. If he fails to show an earning at the end of six months, it is probable he will be returned to the prison.

Under the old system, upon discharge, a man left the prison with a suit of clothing and $5. Now he gets his $5 plus his earnings in the road camp and he has a chance to "go straight" until he can again establish himself in the world. Some of the men already have earnings of more than $200 which will be theirs when they are released.

Many are taking advantage of the new pay law to have needed dental work done. Others are having their eyes tested and glasses fitted against the day when they will be free.

REAL HONOR CAMPS.

The prison road camps are honor camps in every sense of the word. The man in prison must make a voluntary application, backed by a good conduct record, to get a chance to

(Continued on next page.)

WIDENING OF THE MOUNTAIN SPRINGS GRADE—Before and after views on the road between San Diego and El Centro where the Mountain Springs grade has been widened and traffic conditions greatly improved. (Photos by Division VII.)

BUILDING THE NEW HIGHWAY INTO THE YOSEMITE—Upper right, burros carrying explosives along the partly completed grade; upper left, convict laborers watching the result of a big blast; right center, Governor Friend Wm. Richardson (center) inspecting the Briceburg Prison Camp, accompanied by George A. Van Smith, president of the State Board of Prison Directors (at the Governor's right), and U. A. Smith, sergeant of the guard at Briceburg; lower left, bridge across the Merced River connecting the camp with the railroad station. Views at lower right show the new grade line and a steam shovel at work. Inset, W. B. Albertson, camp superintendent.

CONVICT LAW REVIEWED

(Continued from page 3.)

go to the camps. When he gets there, every two days he works cuts an additional day from his sentence. Good conduct and willing work in the camps have great weight with the Board of Prison Directors in granting paroles. The men have every reason to remain; not only have they a chance to earn money and reduce their sentences but the added inducement of the physical enjoyment of healthful outdoor life.

A reward of $200 is allowed by law for the capture of men escaping from the road camps and is prorated against the earnings of the men in the camp at the time of the escape. Few leave, however, although escape is not impossible under the conditions prevailing. Most of those who try to get away are soon caught and taken back to prison with all their earnings and credits lost. Once in awhile a man goes back voluntarily, but not often.

Under the law, all forfeitures go into the Prisoners' Fund for educational and recreational work in the road camps.

TURNOVER LOW.

The turnover in the camps averages about 8 per cent. This is one of the important factors in the success of the movement. A free labor camp in the remote mountain sections in which the prisoners' work probably would have a labor turnover of 40 to 50 per cent. Experience has shown that it is difficult to get free labor to remain for any length of time on these jobs.

From the above, it is evident that there is no competition with free labor in the use of prison labor in the construction of mountain highways in California. The prisoners are engaged in an activity which is stimulating the progress and development of the entire state and if not so engaged they would be spending their time in prison at the expense of the people.

The law provides that all skilled labor must be performed

by free men and strict adherence to the law is the rule of the highway commission. Bridge builders, steam shovel operators, truck drivers and the like are free men in the prison road camps.

GREAT BENEFIT TO MEN.

One has but to observe the pale, listless men who come from the prisons to the road camps, and to see the change which comes over them with a few weeks of healthy outdoor life, plenty of good food and eight hours of work a day, to know that there can be no question of the value of the prison road camp from the standpoint of the prisoner. His spirit is revived. The man earns his way, builds up his self respect, and is discharged physically fit to face the world. In other words, he is given a real opportunity to make good.

It may be said, then, that the California Highway Commission is engaged in a humanitarian work in the employment of prison labor in the construction of highways. While it can not yet be claimed that the plan is reducing the cost of state highway work in California, it is bringing about a saving to the state in the cost of maintaining the state prisons.

When a man leaves for the road camp, the prison is immediately relieved of the expense of his confinement. Authority over the men, as regards discipline, remains with the prison, but the cost of his transportation to the camp, the salaries of the guards furnished by the prison, as well as all other expenses of the camps, are borne by the highway commission.

STRIVING FOR ECONOMICAL OPERATION.

When the commission is in a position to say positively that convict labor work is costing no more than the same work would under private contract, or better still, that it is costing less than would be possible under contract, then a great good has been accomplished for state highway construction as well as for the inmates of the state prisons.

If such a result can be brought about by the economical and efficient operation of the camps, and every effort is now being put forth to that end, the time will have arrived for an expansion of the prison camp work, the establishment of additional camps, and the employment of a greater number of men from the prisons.

Such an expansion, however, as has been pointed out by State Highway Engineer R. M. Morton, is inseparably bound up with the question of the refinancing of state highway construction. Prison road camps have proved successful only in remote mountain districts. This means primary construction and funds for new work are now practically exhausted.

If funds were available to continue work of this nature, it is probable the commission could use 1500 prisoners on construction of mountain roads. Until it is, the present program will mark the limit of the commission's activities in the use of convict labor.

Officers of the Las Turas Lake Club, Los Angeles County, have written Division VII expressing appreciation of the efforts being made to care for traffic during the repaving operations between Calabasas and the Ventura County line.

GOVERNOR VISITS PRISON CAMP

KEEN interest in the convict road camp activities of the highway commission was evidenced by Governor Friend W. Richardson during his recent visit to the Briceburg camp on the Yosemite lateral. The Governor was accompanied by George A. Van Smith, president of the State Board of Prison Directors, Ben H. Milliken, superintendent of prison road camps for the commission, and William Schleip and A. C. Malm, of the accounting department of the State Board of Control. The Governor's young son, John, also was a member of the party.

Governor Richardson spent some time inspecting every department of the camp as well as the construction work under way. He left enthusiastic over what he saw and his enthusiasm was shared by Director Van Smith.

OFFICIALS PLAN VISIT.

The other four members of the prison board—Directors Thomas M. Gannon, J. G. Mattos, Jr., J. E. Olmstead, and Will F. Morrish—have expressed equal interest in the prison road camp work and plan to visit some of the camps in the near future.

The entire board is cooperating cordially with the highway commission and Superintendent Milliken and this cooperation is one of the big factors in the success of the prison road camps under the new pay law.

CONVICTS BUILDING STATE'S "SHOW" ROAD INTO YOSEMITE

CLINGING to the south slope of the steep canyon of the Merced River are the tents of the Briceburg prison road camp of the California Highway Commission, the first to be established in Division VI. The camp is located directly opposite the little hamlet of Briceburg, a station on the Yosemite Valley railroad, fifty miles east of Merced, and is connected with the railroad by a suspension bridge, recently erected for transportation purposes.

The Briceburg camp is composed of men from San Quentin prison and is known as Camp E. Its forty tents shelter over 200 prisoners and thirty free men. It has a small, clean, well equipped hospital; a library, fairly well stocked with books and magazines; a recreation tent; a barber shop; a large bathhouse; a shoe and tailor shop, and an ice plant. Electric lights and running water have been installed for convenience and comfort.

The Briceburg camp came into existence December 6, 1923, upon the arrival of 100 prisoners who had been working on the Klamath River highway in Siskiyou County. Previous to their arrival, thirty men had been transferred to construct the camp.

START MADE DECEMBER 7th.

On December 7th, under the direction of Superintendent W. B. Albertson, the men spread out along the south side of the Merced River, carrying shovels, picks, axes, and other necessary tools, and construction began on the last sixteen miles of the Yosemite lateral.

When at work, the men are distributed along the bank of

(Continued on next page.)

SCENES IN NORTHERN PRISON ROAD CAMPS—Upper left, new grade along the Klamath River, Siskiyou County, built by prison labor; at right, prisoners eating their noon meal "on the grade"; center, famous drag line outfit, building approaches to the proposed bridge across the Klamath at Requa, Del Norte County; lower left, blast in Siskiyou County, placed and fired by convicts without damage to the bridge; lower right, steam shovel operations and a typical convict's tent home in one of the camps.

BUILDING YOSEMITE ROAD

(Continued from page 5.)

the river in the following groups: brush gang, those who clear the right of way; trail gang, builders of a narrow trail on the grade line of the embryo highway; drillers, machine and hand, the men who bore into solid rock; powder gang, the dynamiters; the muckers, the pick and shovel men; the steam shovel crew of free men and finally the slopers.

WORK PROGRESSING RAPIDLY.

To date three miles of roadway, practically thirty feet wide, much of it through rock, has been completed, besides considerable clearing, drilling and other preliminary work on the fourth and fifth miles. The cost of the work is now averaging 85 cents per cubic yard.

Such good progress has been made that an advance camp has been established at Sweetwater, four miles from Briceburg. In a few weeks another camp will be established at South Fork, nine miles from Briceburg, where 100 men will be stationed. Later on, it is probable the entire camp will be moved to South Fork, as the work nears completion.

The Yosemite highway is being built on high standards of grade alignment and width, and when completed will be one of the show roads of California and a monument to convict labor.

Evenings and Sundays are periods of rest and recreation. The prisoners are free to come and go within the camp limits and along the highway, reporting only at meal times and at nine o'clock at night. Some go fishing or on long tramps in the surrounding mountains, while others go bathing in the cool and invigorating Merced. Many, however, stay in camp to read or study.

Men from all walks of life are here: bankers, porters, doctors, farmers, merchants, shoe-shiners, musicians and college professors. They represent many nationalities. Some are well educated, many probably have never seen the inside of a schoolroom.

CAMP HAS BAND.

The camp has a small band and a radio receiving set. Dances are held frequently, the men alternating as "ladies." During the New Year's Day dinner, a group of the prisoners appeared in a cabaret that was a great success, due to the artistic skill and untiring efforts of one of their number, a former professional in this line.

As trains of the Yosemite Valley railroad pass on the other side of the Merced Canyon, to and from Yosemite Valley, brakemen call the attention of passengers to the work under way on the state highway across the river. Passengers often shout greetings to the men and keen interest in the progress of the work is being displayed by the many visitors to the national park.

TIGERS BEFRIEND CONVICTS

Baseball players and fans in the prison road camps have a warm spot in their hearts for the Vernon Tigers of the Pacific Coast League. Learning through Superintendent Milliken that the prison camp ball teams were in need of equipment and that state funds were not available for its purchase, the Tigers boxed up a shipment of some 150 baseballs for use by the camp teams. The gift has been gratefully received.

SUCCESS OF CONVICT CAMPS DEPENDS ON SUPERINTENDENTS

THIS HAS BEEN THE EXPERIENCE IN DIVISION II, WHERE MUCH WORK HAS BEEN DONE, SAYS DIVISION ENGINEER COMLY

"WE have found that the success of a convict road camp depends primarily upon the man in charge. There are few men who can successfully manage such an organization."

This is the declaration of Acting Division Engineer H. S. Comly of Dunsmuir, in outlining the accomplishments of convict labor in Division II, from 1916, when the first camps were established, to the present time.

The division's first three camps began work in 1916. One was located on the Downieville lateral, between Camptonville and Downieville; a second on the Susanville lateral in Lassen County; and a third near Round Mountain, east of Redding. The Susanville and Round Mountain camps were in operation about four months and each constructed about a mile of highway.

The camp in the North Fork of the Yuba Canyon, however, proved more successful and this organization, composed of men from Folsom prison, has been in continuous existence to the present time. On the records of the highway commission it is known as prison road camp 3. H. L. Montfort was in charge at first. He was succeeded by L. H. Taylor, and later by R. W. Brown, the present superintendent.

BUILT DOWNIEVILLE LATERAL.

On the Downieville lateral, the prisoners of camp 3 moved approximately 550,000 cubic yards of earth and rock in the building of forty-six miles of highway, besides blasting in solid rock for the foundations of several large reinforced concrete bridges. The cost of the work was $735,000. This cost includes clearing, drainage structures, equipment and incidentals, in addition to the grading cost.

After the completion of the Downieville job, the camp was moved to the Trinity lateral, route 20, where several camps have been located, in connection with steam shovel operations by free labor. To date, twenty-seven miles of graded road has been completed on the Trinity route. Yardage moved totals 650,000 cubic yards at a cost of approximately $726,000, including clearing, drainage structures, etc. Convicts have moved 100,000 yards of excavation before the power shovels were actually on the job.

A summary of the work done by this Folsom organization—camp 3—from 1916 to date, shows 76.6 miles of highway graded, representing the movement of 1,250,000 cubic yards of excavation at a cost of $1,460,476, including permanent drainage structures, equipment, clearing, surfacing and other items.

Early in July, the camp will be moved to the Kern River canyon for work on the Walker Pass highway.

SAN QUENTIN CAMP.

In 1921, a camp of fifty men from San Quentin prison was established at Ingot, east of Redding. The camp remained at this point until August, 1922, when it was moved to the Klamath River highway, west of Hornbrook. At Ingot, it completed the grading of about two miles of highway, moving 25,000 yards at a cost of $64,000.

On the Klamath River, the camp was more successful, completing eleven miles of grading in a little over a year's time. The work involved moving of 152,000 cubic yards of excavation and the placing of 10,000 yards of gravel surfacing, besides drainage structures, at a cost of $285,000. On the Klamath River, the camp was under the superintendency of L. H. Taylor. In November, 1923, it was moved to the Merced River canyon for the construction of the Yosemite lateral. It is known as Camp E.

A review of all the highway built by convict labor under the direction of Division II shows 88.6 miles of grading completed, mostly heavy mountain work, at a cost of $1,849,780, including drainage, structures, brushing, clearing, surfacing, equipment, and other costs entering into the work.

This is an average of $20,880 per mile. At present yardage is being moved on the Trinity lateral at a cost of 84 cents a cubic yard.

In the early days of convict road building most of the work was done with pick and shovel; later, wheelbarrows and teams were added. Now steam shovels, air compressors, trucks and other modern tools are a part of the equipment of all the prison road camps. Skilled work, of course, is performed by free labor.

EARLY PROBLEMS OVERCOME.

Guards from the prisons refused to place confidence in the men at first and insisted upon the same sort of discipline in the camps as is enforced in the prisons. This was the biggest difficulty encountered, but after a few months their attitude changed and more progress was made.

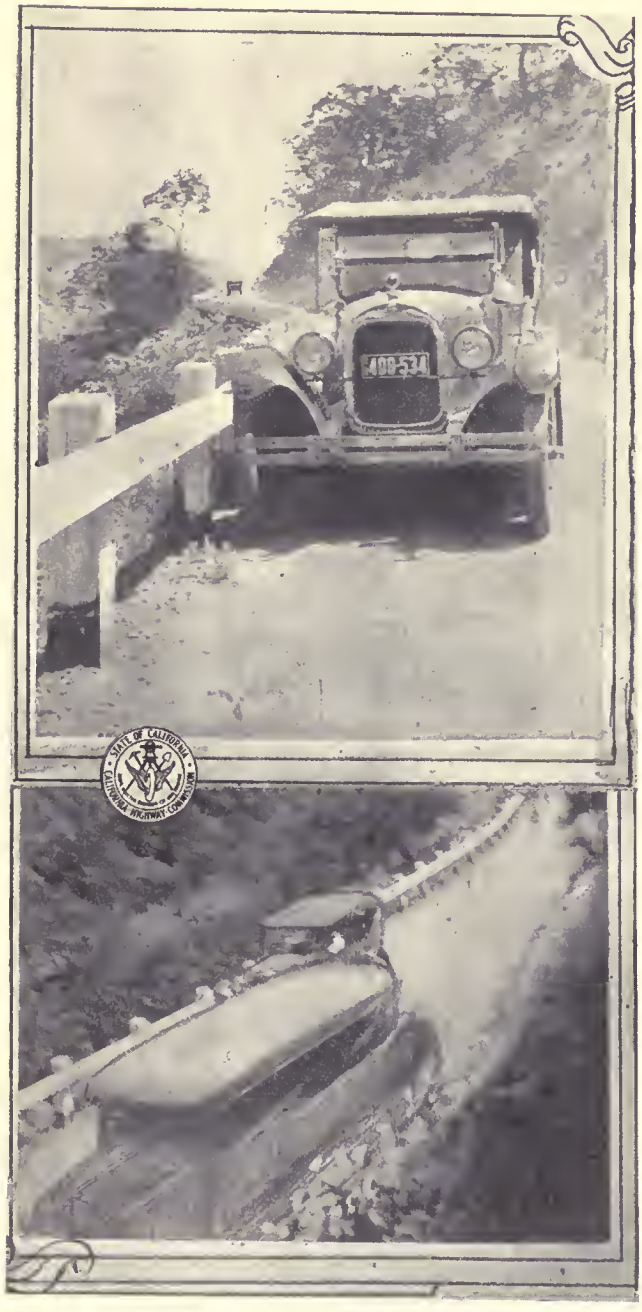
The work started with thirty-two convicts in camp 3, the Folsom camp, and by the end of the first year 108 men were

(Continued on page 9.)

PACOIMA BRIDGE DEDICATED—New Pacoima Wash bridge, near San Fernando, Los Angeles County, recently dedicated with public ceremonies.

NEW PACOIMA BRIDGE DEDICATED

PAVING of the approaches of the new Pacoima Wash bridge, near San Fernando, Los Angeles County, has been completed and the bridge formally accepted and dedicated to the public service. Dedication ceremonies were held at the bridge site May 27th when an address was delivered by Commissioner N. T. Edwards, who accepted the structure upon behalf of the state. It is now open to traffic.



THE GUARD RAIL THAT HELD—Automobile photographed in the Shasta River canyon at the spot where the new type guard rail prevented it from being hurled into the canyon when struck by a passing motor stage, as shown in the second view.

NEW GUARD RAIL SAVES LIVES

THE new standard guard rail recently authorized by State Highway Engineer R. M. Morton proved its worth recently when it is credited with saving the lives of Mr. and Mrs. R. Avery when their machine was struck by a motor stage in the Shasta River canyon, on the Pacific highway, in Siskiyou County.

Mr. Avery explained to Maintenance Foreman G. H. Nutting that he scraped the guard rail with his fender in an effort to avoid being hit by the oncoming stage, but the rear of the stage, in passing, struck his car with such force that it undoubtedly would have been hurled off the grade into the river, 100 feet below, had it not been for the guard rail.

PHOTOGRAPHS TAKEN.

Foreman Nutting asked Mr. Avery to return to the scene of the accident several days later when the Avery car was photographed in the exact spot where the guard rail held as a stage was passing, to illustrate the manner in which the accident occurred, as shown at left.

Numerous serious accidents have occurred in this canyon in past years, and the present commission authorized erection of the heavy guard rail until such time as funds are available for relocating and widening this section.

CHAIRMAN TOY GETS HIGHWAY CONVENTION FOR WEST

CALIFORNIA has been awarded the 1924 convention of the American Association of State Highway Officials. It will convene in San Francisco November 17th to 20th. This was the good news received at headquarters early this month from Chairman Harvey M. Toy who attended a meeting of the executive committee of the association in Greensboro, North Carolina, June 4th, at which time the decision was made.

The convention will bring to California highway officials of practically every state in the Union, prominent highway engineers, as well as leading officials of the United States Bureau of Public Roads, and others active in the highway movement throughout the country.

Chairman Toy, who is a member of the executive committee, went east armed with invitations from Governor Richardson, Mayor James Rolph of San Francisco, the California State Automobile Association and the Highway Commission.

Plans will be begun at once for the holding of the convention and the entertainment of the many prominent visitors expected.

WIDER RIGHTS OF WAY

AT a meeting of the California Highway Commission in San Francisco, May 21st, a resolution was adopted declaring it the policy of the commission not to accept rights of way in the future less than eighty feet in width.

Rapidly increasing traffic, the necessity for widening many of the existing highways, and the difficulties being encountered are some of the reasons for the step the commission has taken. In many places, rights of way 100 feet wide and even wider are being secured as a safeguard for the future.

The change in policy was recommended by State Highway Engineer R. M. Morton.

PHOTOGRAPHS REDUCE SURVEY COST

Large airplane photographs of the territory along San Francisco Bay, to be traversed by the Bay Shore highway, have been secured by Division IV from the army air service for use in connection with preparation of plans for the construction of the highway. Use of the photographs reduced the cost of survey work on the project.

COMLY TELLS OF CAMPS

(Continued from page 7.)

employed. There are 203 on the rolls at present. During the eight years the organization has been in existence, 1752 men have been received from the prison and have passed through the camp to a parole or discharge.

ESCAPES ARE FEW.

Of this total of 1752, only 110 have attempted to escape, and of this number, eighty-nine have been apprehended and returned to prison with all credits lost and additional time to serve.

Much information of interest to taxpayers of the state is revealed by a study of the records of Camp 3. Since its organization in 1916, it shows 473,040 convict working days put in on the state highways, not counting Sundays, holidays or days when the men could not work because of weather conditions. If not employed on the highways, this time would have been spent in idleness in the prison at the expense of the people.

The men have not been repressed in the matter of recreation and amusement. An orchestra of excellent musicians has been organized. It has been permitted to play for various entertainments and the money earned has been placed in the camp recreation fund and used to purchase a motion picture machine, radio outfit, and uniforms for the baseball team which has won nine out of ten games played this season. The ball club is backed by the entire population of Trinity County.

The camp library has 275 volumes, supplied chiefly by Miss D. C. Provines, librarian of Sacramento County. Technical works are provided for study and the library also received a number of periodicals as well as daily papers.

Camp discipline is in the hands of Sergeant Thomas McDonough and six assistant guards from Folsom prison.

CONVICTS PIONEER ROAD BUILDERS IN MENDOCINO

IN the Fall of 1915, two prison road camps, using men from San Quentin prison, were established in the fastnesses of Mendocino County near Leggett Valley, forty-eight miles from Longvale, the nearest railroad station, reports Division I. There was an old wagon trail from Longvale to Cummings, a distance of thirty-seven miles, but from there to the camps was a virgin wilderness, with not even a pack trail. An emergency road was built from Westport, on the coast, to Leggett Valley, over which men and supplies were transported to begin the work.

The line, as then established for convict work, is now on the through state highway in Mendocino County. It follows the courses of heavily timbered river canyons, and construction work was slow and difficult.

For the first two years, the work was done almost entirely with pick and shovel, but as soon as the trail was pushed through to Cummings, teams were employed and, in 1918, a steam shovel was placed in operation.

CAMPS WELL LOCATED.

All of the convict camps in this division have been located in beautiful surroundings where there were abundant supplies of spring water. Good living accommodations and plenty of wholesome food were provided by the state highway commission.

The early camps averaged about 100 prisoners each, in charge of a head guard and assistants, designated by the prison authorities. The state highway commission was represented by a superintendent and a few foremen who laid out and supervised the work on the grade. The first camps were more or less experimental, and we can now see that undue authority rested in the prison representatives in connection with the road building part of the work.

REORGANIZATION BRINGS CHANGE.

Confusion and friction sometimes resulted from the unbalanced dual authority and gradually there came about a reorganization of the administration of the camps. Highway commission representatives were accorded full control of all matters affecting the maintenance of the camps and the work of building the roads. Discipline of the convicts, as the state's prisoners, is still in the hands of the guards from the prisons.

Eventually, a smooth running organization was built up, and in Mendocino County, a very considerable section of state route number 1, now known as the Redwood Highway, was constructed by prison labor. On sections totaling fifty-six miles in length, nearly all of the original highway was built by convicts between the years 1915 and 1920.

In May, 1920, the camps were transferred to Humboldt County and began the construction of the Willow Creek lateral, connecting Eureka and Arcata with the Trinity River country and the Pacific highway at Redding. Twenty-two miles of this road were built from 1920 to 1923, and the convict camps were then moved to the Klamath River, in Del Norte County, where they are now engaged in constructing several miles of the approaches to the proposed Klamath River bridge.

NEW CAMP PLANNED.

A new camp is now being established and trails and temporary bridges constructed on Smith River, about twelve miles northeasterly from Crescent City on the Grants Pass route. When preparations are completed, a part of the Klamath River camp will be moved to the new location.

The Klamath River camp is composed of prisoners from San Quentin prison and is known as Camp A of the highway commission's prison road camps.

Construction costs in the convict camps in the north coast counties vary according to the seasons of the year, the cost going up during the period of heavy winter rains. At present, grading is being done for 90 cents per cubic yard.

Through the efforts of Superintendent Ben Milliken and his assistant, Fred Seymour, excellent reading material is being furnished the prison camp libraries. A number of the leading magazines of the country—educational, fiction, and scientific—have promised to supply the camps with free copies each month.

RECREATIONAL ACTIVITIES IN THE PRISON ROAD CAMPS—Weaverville "Highways," baseball team of the Trinity Camp, several of the star players being prisoners; upper right, the team's goat; lower left, "con" wrestlers ready for a "go"; lower center, ball game in progress, Requa Camp; right, the "convict chorus," one of the acts during the New Year's Day cabaret at the Briceburg Camp.

CALCIUM CHLORIDE TESTS

EXTENSIVE tests to determine the value of calcium chloride for "curing" concrete pavements as a substitute for the present "ponding" method are being undertaken at Sacramento, under the direction of the Construction Department and in cooperation with the Portland Cement Association.

If the experiments prove successful both the time and cost of finishing concrete pavements in California may be considerably reduced.

Mr. C. S. Pope, construction engineer, has assigned the work to Mr. C. L. McKesson, of the laboratory research staff, and he is working in cooperation with Professor Duff Abrams of the Lewis Institute of Chicago, in charge of research work for the Portland Cement Association. Professor Abrams' chief assistant, H. F. Gonnerman, will be in Sacramento beginning June 23d.

HOW THE TESTS WILL BE MADE.

The tests will be made with a series of about 300 beams 7″ x 10″ x 38″, to be cast and cured by the following methods:

One series covered with earth and watered fourteen days, another seven days, and a third three days; one series without any covering of water and another series with 2 pounds of calcium chloride per square yard, one with 3 pounds per square yard, one with 5 pounds per square yard, another with a covering of sodium silicate, and still another with waterproof curing paper.

The beams will be broken in the laboratory in 14, 28 and 90 days, and strengths compared.

Additional field series may be made later to verify the results obtained in Sacramento and under different conditions prevailing in other sections of the state.

Careful records will be kept of humidity, temperature and wind velocities, all of which are factors in curing of concrete.

Field tests are now being made on a paving job in Los Angeles County and it is probable that additional field tests will be made on the Kaiser paving job south of Sacramento.

SWEDISH ENGINEER INSPECTS CALIFORNIA STATE HIGHWAYS

E. G. ALMQUIST, of Stockholm, Sweden, lieutenant in the Royal Engineering Corps of that country, spent several days recently at headquarters and in trips through several of the divisions, while on a year's leave of absence for the purpose of studying highway construction in the United States.

In Sacramento, Lieutenant Almquist spent considerable time with the bridge engineers, discussing American designs and comparing them with those of his own country. While Sweden has built many fine bridges, California is far ahead of his country in highway paving, the visitor said after viewing operations of the Kaiser Paving Company in Division X, south of Sacramento.

The Swedish engineer also spent some time at the testing laboratory where he found many things of interest. While in San Francisco, engineers of Division IV escorted him over the Skyline boulevard and roads in the State Redwood Park. He praised highly the state highways about San Francisco.

PLAN UNIFORM ACCOUNTS

HIGHWAY accountants from Arizona, Nevada, Wyoming and California met in San Francisco recently for the purpose of discussing plans for a uniform accounting system in the highway departments of western states that will make possible a common basis for comparison of construction costs and statistical reports.

The movement had its inception at the last meeting of the Western Association of State Highway Officials, held in Salt Lake City, when a subsidiary organization of that body was formed to be known as the Western Association of State Highway Accountants.

The latter organization conducted the San Francisco meeting and began work on its report which will be presented to the next convention of the parent association to be held in Yellowstone Park next month. A draft of a classification, classifying expenditures under general heads, was prepared to be included in the report of the accountants.

Those attending were: Floyd O. Booe, of Nevada; Samuel B. Jones, Arizona; C. C. Warrington, Wyoming; H. B. Weaver, California; C. M. Smith, traveling auditor of the California Highway Commission; James Moriarty, chief clerk of Division IV, San Francisco; and several representatives of the San Francisco office of the United States Bureau of Public Roads.

At the Briceburg prison camp an inmate doctor is now in charge of the camp medical work and the hospital. During the months of March, April and May, this year, 195 convict working days were lost because of sickness among the men. During the same period of 1923, under a free doctor, the men lost 353 days. The inmate doctor gets $2.10 a day for his services but he keeps the boys at work.

WHERE THE CONVICTS WILL WORK—Survey parties in the Kern River canyon, east of Bakersfield, Division VI, getting ready for construction work by a prison road camp.

PRISON ROAD CAMP WORK IS COORDINATED UNDER MILLIKEN

THE necessity for centralized supervision of the prison road camp work of the highway commission became apparent with the enactment of the new pay law by the 1923 legislature. Prior to this time, the work had been carried on in the various divisions in much the same way as other day labor work.

BEN H. MILLIKEN

State Highway Engineer R. M. Morton decided to create the position of Superintendent of Prison Road Camps in the headquarters office and selected for this place, Ben H. Milliken, at that time in charge of maintenance work on the Big Oak Flat road and the Alpine highway, and for six years an employee of the commission in various capacities.

LAW PUT INTO EFFECT.

Under Mr. Milliken's direction, the prison camp work has been coordinated under one central administration, and the new law, with the increased clerical work incident to the pay features of the bill, put into effect.

For the first time, the prison work has had a responsible head to settle the many problems arising from the dual control of the camps by the prisons and the highway commission. Past difficulties and misunderstandings have been wiped out, and a splendid spirit of cooperation built up between the highway commission and the board of prison directors which is shared by the representatives of the two bodies in actual charge of the camps in the field.

SAN FRANCISCAN AIDS WORK.

Mr. Julian H. Alco of San Francisco, a student of prison problems, who was instrumental in getting together the support which brought about passage of the pay law, has been deeply interested in its practical application.

Mr. Alco presented his plan to State Highway Engineer Morton and to Chairman Harvey M. Toy and Governor Richardson early in the session, and with their approval successfully urged its enactment before the legislature.

In carrying on this work, Superintendent Milliken has worked with Purchasing Agent L. R. Smith in securing supplies for the camps at the lowest possible figures, and by keeping constantly in touch with the camp superintendents, has aided in many ways the successful conduct of the work.

LABOR LEADER VISITS BRICEBURG

PAUL SCHARRENBERG, well known labor leader and secretary of the California State Federation of Labor, recently visited the prison road camp at Briceburg, on the Yosemite lateral, for the purpose of studying the actual working of the new convict pay law system.

He was met by Superintendent W. B. Albertson, who explained to Scharrenberg in detail every phase of the camp's operations. The visitor expressed himself as well pleased with what he saw and with the way in which the new plan is being carried out.

REPORTS FROM THE DIVISIONS

DIVISION III.

HEADQUARTERS, SACRAMENTO.
G. R. WINSLOW, DIVISION ENGINEER.
Counties of Butte, Colusa, El Dorado, Glenn, Nevada, Placer, southern Plumas, Sierra, Sutter, Yuba and northern Sacramento and Yolo.

EXCELLENT progress is being made on the initial grading job in the Truckee River Canyon between Truckee and Boco, Nevada County. It will not be long before the contractor will be able to report his work half finished. Grading also is progressing on the Donner summit contract.

Other units of the Truckee River route are being placed under contract by the commission, and the entire Truckee River section will be under construction in the near future. Other sections of Route 37, between Colfax and Donner Lake, also will be under contract in the near future.

WIDENING TAHOE ROAD.

A gasoline power shovel is at work at Emerald Bay, Lake Tahoe, widening the highway about the lake.

Grading of the improved alignment at the Wise power house, near Auburn, Placer County, has been completed.

Similar improvements in El Dorado County are being planned, west of the town of El Dorado.

Paving of the northern entrance of Sacramento is awaiting an agreement with the Western Pacific and Sacramento Northern railroads regarding under passes to eliminate grade crossings.

COLOMA IMPROVEMENTS.

The unit of the Mother Lode highway between Coloma and Placerville has been graded and is being maintained by state forces.

Extensive experiments with calcium chloride are being made in Division III. Results obtained on the new grade between Auburn and Colfax are encouraging. It is believed raveling of the macadam surface has been retarded and the necessity for sprinkling reduced.

DIVISION IV.

HEADQUARTERS, SAN FRANCISCO.
JOHN H. SKEGGS, DIVISION ENGINEER.
Counties of San Francisco, Marin, Sonoma, Napa, Contra Costa, Alameda, Santa Clara, Santa Cruz, and San Mateo.

RAPID progress is being made on several contracts under way in Division IV. Galbraith and Janes have completed the grading on more than four miles of the Santa Rosa-Schellville highway, in Sonoma County. A mile of surfacing has been placed.

Approximately 50 per cent of the grading on the third unit of the Skyline boulevard has been completed by contractor J. P. Holland. Plans and specifications are about completed for several additional units of this road which will be ready for contract in the near future.

Approximately one mile of the resurfacing work has been completed by the Federal Paving Company on the contract south of Milpitas, in Santa Clara County. Grading of shoulders is under way.

ECONOMIES PLANNED.

Maintenance forces are busy widening a section of the Redwood highway between Cloverdale Hill, in Sonoma County, and the Mendocino county line. Upon completion of the work the surfacing will be treated with calcium chloride.

To facilitate storage of asphalt in Division IV, north of San Francisco Bay, a three-compartment concrete storage tank is being constructed at the Petaluma maintenance station. Each compartment will have a capacity of 1½ carloads. Construction of the tanks will permit a saving in asphalt north of the bay, as it will make possible carload purchases instead of by the barrel. An asphalt retort, boiler, and pumps will be shipped from Division VI, where they are being dismantled.

NEW SIGNS IN DIVISION VI—Maintenance section markers placed in the San Joaquin Valley that the "public may know."

DIVISION X.

HEADQUARTERS, SACRAMENTO
J. C. McLEOD,
ACTING DIVISION ENGINEER
Counties of Amador, Calaveras, Alpine, Tuolumne, Stanislaus, San Joaquin, Solano, and Southern Sacramento and Yolo counties.

A SURVEY party under C. W. Springer has completed the relocation of the Central House-Drytown line in Amador County and is now making a survey from Jackson to Pine Grove, on the Alpine Highway. The people of Jackson recently raised $10,000 for work on this road which will be matched with an equal sum by the state highway commission.

The last twelve feet of the twenty-four-foot double strip pavement from Sacramento to the Florin road has been poured by the Kaiser Paving Company and is being cured with calcium chloride in place of the ponding method, used on previous work on this section.

Force and Currigan, the successful bidders on the Vacaville-Batavia paving job, are setting up their plant at Batavia and expect to be spreading asphalt by July 1st. Grading work will be completed before this date.

EXPERIMENT TRIED.

An experiment with liquid calcium chloride is under way on a unit of 2.7 miles of gravel road on the San Andreas lateral between Wallace and Burson. After several weeks of extremely hot weather, the road showed up well. It is planned to extend the treatment further.

A rock crushing and screening plant is being set up near Groveland to furnish surfacing material for the Big Oak Flat road, east of Groveland.

DIVISION VI.

HEADQUARTERS, FRESNO.

J. B. WOODSON, DIVISION ENGINEER.

Counties of Fresno, Madera, Merced, Mariposa, Kings, Tulare, and Kern, north of the Tehachapi.

A CAMP is now being installed at Rich Bar, on the Kern River, preparatory to completing the second unit of the Walker Pass highway between Bakersfield and Democrat Springs. The work will be done by convict labor.

Contractor R. T. Shea has completed the paving on the last unit of the Pacheco Pass highway between Califa and Los Banos, Madera County. This section is 15½ miles long, and consists of an asphalt macadam pavement, eighteen feet wide and six inches thick.

A third steam power shovel has been added to the convict road camp equipment on the Briceburg-Yosemite highway through the Merced River canyon. The prisoners are now working on the fourth mile and have been at work only six months.

DIVISION VII.

HEADQUARTERS, LOS ANGELES.

S. V. CORTELYOU, DIVISION ENGINEER.

Counties of Los Angeles, Ventura, Orange, San Diego, and eastern Kern, south of Mojave.

RAPID progress is being made by Jahn and Bressi on the contract for widening and repaving the highway between San Diego city limits and Oceanside. With the exception of about a half mile laid only half width, the work has been completed between San Diego city limits and Del Mar. Considerable work also has been completed north of Del Mar.

EXPERIMENTS UNDER WAY.

Extensive experiments with calcium chloride as a means of "curing" concrete pavement are under way in connection with the George Oswald contract for widening and repaving the state highway between Shoup Avenue and the westerly boundary of Los Angeles County. Over three miles of pavement have been laid.

Work has started on the widening of the state highway between Los Angeles and Montebello, 2.8 miles. The fifty-six foot pavement is being laid in cooperation with Los Angeles County.

Sam Hunter has a steam shovel on the job in connection with the contract for widening and repaving the Ventura boulevard between the southern boundary of Ventura County and Camarillo.

DIVISION V.

HEADQUARTERS, SAN LUIS OBISPO.

L. H. GIBSON, DIVISION ENGINEER.

Counties of San Benito, Monterey, San Luis Obispo, and Santa Barbara.

THE volume of excavation on the George Pollock contract, south of the Big Sur River, Monterey County, is so large that it will take over two years to complete the work. Four power shovels are now working three shifts a day as continuously as circumstances will permit, in an effort upon the part of the contractor to complete the work, if possible, before the commencement of next winter's rains.

L. H. GIBSON

NEW SHOVEL ON JOB.

A fourth shovel has been purchased to take the place of the one recently lost when the grade gave way, permitting the heavy piece of machinery to plunge several hundred feet into the ocean. This fourth shovel is proceeding southward over the contract completing the "finish" grading.

SALMON CREEK ACCESSIBLE.

With the practical completing of the Blake and Heaney contract, on the southern end of the San Simeon-Carmel highway, Salmon Creek and Salmon Falls, in southern Monterey County, have been made accessible to the motorist.

WIDENING RESULTS.

Extensive widening of cuts and fills on the Coast highway in Santa Barbara County has been under way for sometime with splendid results. A minimum width of roadway of thirty feet, and where possible much wider, is being obtained.

The major advantages of the work now under way is pointed out by Division V as follows:

First, a wider roadway for the accommodation of traffic; second, increased visibility on curves, making the road safer; and third, collection of all drainage at a maximum distance from the pavement, insuring a well drained subgrade. This is particularly desirable and will add to the life of the pavement as much of the soil in the vicinity is adobe.

DIVISION II.

HEADQUARTERS, DUNSMUIR.

H. S. COMLY, ACTING DIVISION ENGINEER.

Counties of Siskiyou, Modoc, Trinity, Shasta, Lassen, Tehama, and northern Plumas.

EXTENSIVE widening and straightening work, under way between Bayha and Half Way Creek, north of Redding, is attracting the attention of thousands of motorists who are now traveling the Pacific Highway. The improvement is apparent to all and is being highly commended.

The Nevada Contracting Company, holder of the contract, is making good progress and is approximately 20,000 cubic yards ahead of the contract schedule. The road is now open to traffic from 7 a.m. to 10 p.m. The division has a detour engineer in charge.

PAVING MOVES FORWARD.

The Kaiser Paving Company is making good progress on the grading and paving contract between Redding and Bayha. Some difficulty was encountered because of a shortage of water but this has been overcome. The grading is practically finished and more than two miles of concrete paving has been laid.

Dunn and Baker have completed their contract for widening and straightening the highway from the Oregon line south, a distance of ten miles, and have been granted an extension of four miles by the commission. The heavy work on the extension will be undertaken after the season of heavy traffic is over.

GUARD RAILS INSTALLED.

Calvert, Calvert, Schroeder and Pearce have completed their contract for the erection of guard rails in the Shasta River canyon.

The Warren Construction Company is starting work on the surfacing of the recently graded unit of the Susanville-Reno highway, in Lassen County.

T. H. and M. C. Polk, contractors, are at work surfacing a unit of the Red Bluff-Susanville lateral, east of Chester, and expect to complete the work on schedule time.

As soon as preparations are completed, state forces will begin construction of 2½ miles of the Weaverville lateral, near Weaverville. Surveys recently were made for the work.

Widening and thickening of the Coast highway from San Diego to Oceanside has been begun and several important improvements in the alignment of the present route will be made.

CALIFORNIA HIGHWAYS

OFFICIAL PUBLICATION OF THE

CALIFORNIA HIGHWAY COMMISSION

SACRAMENTO, CALIFORNIA

HARVEY M. TOY, Chairman;

N. T. EDWARDS and LOUIS EVERDING, Commissioners.

ROBERT M. MORTON, State Highway Engineer.

W. F. MIXON, Secretary.

We are pleased to permit publication of any of the matter contained herein and this privilege is extended newspapers and periodicals without restrictions.

FRANK B. DURKEE - - - Editor

P. O. Box 1103, Sacramento, California.

Vol. 1. JUNE, 1924 No. 6

JUST AMONG OURSELVES

☆ ☆ ☆

HIGHWAY NEWS NOTES

Miss Younggren Weds.

MISS Judith Younggren, employed in the purchasing department of the California Highway Commission for the past five years, has resigned. She was married Sunday, June 2d, to Mr. Carl Almquist, proprietor of the Court Garage in Sacramento. "P. A." Smith hopes the epidemic will not spread, but strongly suspects Miss Charotte "Sharkey" Barnes has designs on some poor man.

Division VI News.

Elmer Stump, resident engineer in charge of the Three Rivers-Sequoia Park contract and curve widening in the same locality, has been transferred to Red Bluff, in Division II.

B. H. Burrell, resident engineer in charge of the asphalt macadam contract at Chowchilla on the Pacheco Pass lateral, has been transferred to the headquarters bridge department.

Notes From Division III.

John L. Piper has been assigned to the position of resident engineer for the Colfax to Gold Run grading contract, Placer County, which is expected to start in the near future.

C. O. Dingle, resident engineer on the recently completed Stony Creek bridge, Glenn County, will have similar charge of the paving to be done west of Chico and, pending award of the contract, has been assigned to temporary duty at the division office.

George I. Battelle, right of way man in Division III, has been transferred to headquarters.

Palmer Holt and Harry N. Harper, draftsmen, have been transferred to headquarters. The latter is with the bridge department.

Fred R. Holm, draftsman, has transferred from Division III to Division X.

H. R. Church, assistant resident engineer, has been assigned to duty temporarily with H. C. Darling, locating engineer at Crystal Springs, Placer County.

Paving Inspector Named.

H. A. Simard, assistant resident engineer, has been transferred from the Bay Shore Highway to San Jose where he will act as asphalt inspector on the contract for widening and resurfacing the highway between Milpitas and Coyote Creek.

J. H. Skeggs, division engineer, has returned to San Francisco after a month spent on the examining board for the Civil Service Commission in connection with examinations for the classified engineering service.

Miss Marie Lennox, senior clerk, has been transferred to the headquarters of Division IV, San Francisco, from the State Department of Architecture, Sacramento.

J. Upham, formerly with Division II, has accepted employment with Division IV.

Mrs. Viola Hine, stenographer, has transferred from the division headquarters at Fresno to Division IV, San Francisco.

A Real Fish Story.

R. A. Mitchell, of Division I, Willits, reports fishing is excellent in Eel River. On a recent trip to the fishing founds, he made a catch of twenty-two trout in a short while, four of which were over sixteen inches in length.

Fred Nelson, Division I mechanic, sustained a broken leg recently in an accident near Garberville.

Division V News.

John Verduin, resident engineer in charge of the reflooring of the Nacimiento bridge near San Miguel and on other bridge work in Division V, has tendered his resignation and returned to his home in Portland, Oregon.

W. L. Judkins, a chief-of-party and resident engineer in Division V in the "before the war" days, will succeed Verduin as resident engineer on the Nacimiento bridge job.

C. F. Marshall, resident engineer in charge of construction on the Chittenden Pass road, has been granted a year's leave of absence and will undertake certain work for the county surveyor of Sacramento County.

Faithful Employee Passes.

Headquarters shop reports with regret the passing away on June 1st of an old and faithful employee, W. O. Lumry, who had been employed as blacksmith in Division III and the headquarters shop for over five years. Mr. Lumry was one of our most faithful workers and his cheerful disposition and unfailing good nature endeared him to all with whom he came in contact.

Division X News.

H. O. Ragan, formerly with Division VIII, has assumed his new duties as resident engineer on the Vacaville to Batavia paving contract.

Fred R. Holm, formerly with Division III, has been transferred to Division X, as draftsman.

James L. Kerins has joined Division X forces as clerk. He was formerly with the State Board of Health.

Another Proud Daddy.

P. R. Green, chief draftsman at the Eureka suboffice of Division I, is now a proud daddy. He says the boy will challenge any other highway engineer of the same weight.

Promoted to Foreman.

L. W. Seymour, for the past seven years timekeeper on state highway work in the vicinity of Lake Tahoe, has been promoted to maintenance foreman on the Placerville-Coloma highway recently taken over by the commission for maintenance.

Sidney W. Griggs Passes Away.

Sidney W. Griggs, draftsman in the Los Angeles office, and formerly with headquarters at Sacramento, died Saturday, May 24th, at his home in Glendale. Deceased is survived by his wife, Mrs. Helen Griggs, three sons, Donald B., Robert A., Allen H., and a daughter, Helen Louise, born May 10, 1924.

It is with deep regret that the Bulletin announces the sad deaths of the mothers of Mr. Fred Seymour and Miss Katheryn B. Melarkey which occurred recently on the same day.

I. S. Voorhees, assistant maintenance engineer, Division VII, was called to New York City recently on account of the death of his mother.

H. C. Reeder has been assigned to the George Oswald contract on Whittier boulevard as resident engineer.

SMILEWAYS

We Believe It.

MEMBERS of the construction department declare that the only difference between Mr. Pope's writing and King Tut's is that the boys were able to read Tut's stuff.

The Breed Vehicle Act makes no mention of sardine cans, but in a recent accident a "small car" which overturned contained eleven passengers.

An Accommodating Music Shop.

A pretty young woman stepped into a music shop and tripped up to the counter where a new clerk was assorting music. In her sweetest tones she asked: "Have you 'Kissed Me in the Moonlight'?"

The clerk turned, looked and said: "It must have been the man at the other counter. I've only been here a week."

A rough looking individual came into the office of Division VI the other day and asked for a job as engineer. When told there were no engineering positions open, the man replied:

"Well, I ain't particular just now, I'll take a job firin' 'till I can git an engine."

Tooting the Cow in Japan.

A traveler in Japan tells of curious notices he saw in shop-windows, and especially an official municipal notice to motorists: "If a cow obstruct, toot 'er soothingly; if she continue to obstruct, toot 'er with vigor; if she still obstruct, wait till she pass away."

Looking for Brains.

A colored prisoner fond of imposing words approached the librarian and asked to have a letter written. The librarian was busy and referred the man to one of the muckers.

"Huh!" said the darkey, "That man cahn't write no lettuhs for me! No man cahn write no lettuhs for me dat ain't got no mo' brains than I got!"

Gates Ajar.

"Is this the speedometer?" she asked, as she tapped on the glass which covered that instrument.

"Yes, dear," I replied in a sweet, gentle voice.

"Don't they call this the dashlight?" she queried, fingering the little nickel-plated illuminator.

"Yes, honey," my words floated out softly as before.

"And this is the cut-out?" she inquired.

"Yes, toodles," as I took my foot off the accelerator. Not more than 200 feet away our course was blocked by a fast moving freight train.

"But what on earth is this funny looking pedal?" she said in a curious tone, as she gave the accelerator a vigorous push with her dainty foot.

"This, sweetheart, is Heaven," I said in a soft, celestial voice, as I picked up a golden harp and flew away.

—*Texas Highway Bulletin.*

THE RIGHT SPIRIT

Claude Simpson, connected with the headquarters filing department, while driving on the state highway at night recently, came upon a barricade where the warning lights, for some reason, were not burning. He stopped and relighted several lanterns. This instance of loyalty to the organization by one not connected with the engineering department may have averted a serious accident.

JUST AMONG OURSELVES

(Continued from page 14.)

L. D. Packard, former resident engineer in Division VII, has been transferred to the headquarters bridge department.

J. F. O'Hara has been made chief of a survey party recently organized in Division VII.

Maintenance Man Injured.

Charles Bray, member of a maintenance crew in Division VI, was painfully injured recently when he was struck by an automobile on the Elk Bayou bridge, south of Tulare. He was engaged in spreading a mixture of asphalt over a portion of the floor of the bridge when, in some manner, it became ignited. In escaping the flames, Bray leaped directly in the path of a passing automobile.

Grumm in South.

Fred J. Grumm, headquarters engineer in charge of surveys and plans, represented the engineering department at the annual banquet of the Los Angeles Chapter of the Associated General Contractors of America, held at the Hotel Biltmore, Los Angeles, June 5th.

C. M. McKusick resigned recently as engineer for the Sutter-Butte Canal Company to accept a position with the headquarters drafting department.

Harry Smith, of the headquarters accounting department, felt a patriotic urge recently and joined one of the Sacramento companies of the California National Guard. His first appearance was in the Memorial Day parade.

Equipment Department Notes.

Charles H. Ryon, chief clerk of the Equipment Department, recently completed a trip to Divisions V, VI, VII and VIII in connection with equipment department accounting matters. He reports inauguration of the new rental system is making good progress, considering the length of time the new plan has been in force.

F. E. Burnside, superintendent of the headquarters shop, recently completed a trip through the divisions on a general inspection of division shop equipment. He also assisted the civil service board in holding examinations in various parts of the state for positions in the mechanical trades and as truck drivers.

News From the North.

L. E. Ager, draftsman in Division I, Dunsmuir, enjoyed a vacation trip to Crater Lake and Klamath Falls.

Lawrence Pierce, draftsman, tiring of life in the mountain wilds, made a flying trip to San Francisco to see Al Jolson in Bimbo.

Mrs. Madeline Kearely, clerk, and Miss Josephine Lever, stenographer, have resigned. The vacancies will be filled by Miss Josephine Paul of Sacramento and Miss Pearl Hanna of Los Angeles.

Miss Freda Cromwell, clerk, recently spent a week at Portland, Oregon, and witnessed the Rose Carnival.

R. E. Ward, resident engineer, has been transferred to Susanville. He will be in charge of a new contract for gravel surfacing in Lassen County.

E. R. Weigand and E. M. Hilton, draftsmen, motored to Oakland recently in Weigand's "puddle-jumper."

J. H. Orr, draftsman, has resigned to accept a position at Ft. Worth, Texas.

R. P. Bergh, another draftsman, is moving to Seattle, Washington.

Who Can Beat This?

The largest trout caught this season by an employee of the Dunsmuir office is a 20-inch rainbow which E. N. Babb, chief clerk, brought home from the lower McCloud River.

One point in favor of Richardson: His appointment of the head of the maintenance department of the State Highway Commission. Said appointee is seeing to it that the trees planted along the highway are being watered and cared for.—*Corning Advance.*

FOLSOM SOJOURNER APPEALS TO "MIRACLE MAN" MILLIKEN TO GET HIM A JOB. IF "R. W." CAN'T HELP HIM SUGGESTS APPEAL TO HIS FRIEND "SILENT PEET."

BEN H. MILLIKEN, superintendent of prison road camps and friend of all the convicts, gets many letters, but the one below from a prisoner about to be released from Folsom will be especially appreciated by all who have come in contact with the prison road camp work of the commission:

Represser cal 5th—18—May 1924
Mr Ben. H. Mielikon
Dear Ser

With pleasur I write you. Must say That Mr boss Promest me when I were Plahing with The Band That R. W. and He were going to Give me a Job when I made Peroal Which They sigen my Pappers Twice and sent Tehm En To The Bord. Now I am going up Before The Bord En june inspecting To make Et and I reseaved a letter From R. W. stateing owing to The work Being Scase The Employment is unsigen. here I inclose you a Employment Blank Thinking you ever so mutch if you will seek me a Employment— and I am giveing you my word and Ohner That I wont Pertray your Trust.

I will take a Job on Eather hyeway or Eney Plase Elce. you no Just The Kind of man i am. with Aclean Record out side. I just reseaved a swell Letter of refference on may The 4th from Mr. Allan Pollok. The Gen supt of S. P. Dining Cars hotels and Restauants Co. As Cook. 65 market st San Francisco. sorrow That I am not none in the west only by the rail road Co. for 5 years Employed by The O. S. I. & O. R. & N. & S. P. clear record from every one.

en sigening the Blank it only means To insure me of work going Out of Prison and if work runes out I Can get a nother job, my first Time En. Prison and it is my entenchen To make good. a Job on The ochun i wooden Turn it down.

if there is nothen en your Power Please speek to The Jentmen that they Coll silent Peet as I don't no his reail name but he is a friend of mind, so I think you for Every Thing that you may do for me. hopeing to hear from you At your Earlest Convenet.

James E. Brown No 8538 Banjolist—

(Note: The "R. W." referred to by the writer is R. W. Brown, superintendent of the prison road camp at Schilling, Shasta County, now being transferred to Kern River Canyon; and "Silent Peet" is H. S. Comly, Division Engineer, Division II, Dunsmuir.)

Superintendent Albertson says Milliken "meets the prisoners on their own ground and talks to them in their own lingo. Therefore he is always welcome."

NIGHT CAPS FOR SHADE TREES

DESPITE lack of rain in many parts of the state, 95 per cent of the shade trees planted along the state highways throughout California are alive and making good progress. This is the report of W. E. Glendenning, expert in charge of shade trees for the maintenance department of the highway commission.

Special efforts are being made by the maintenance crews to bring the trees safely through the present summer. In sections of the state where grasshoppers and other similar pests have threatened destruction of the foliage of the trees, small cotton sacks have been placed over them as a protection. At night, the trees present the appearance of strange night-capped ghosts lining the highways.

EXPERIMENTS UNDER WAY.

In other sections, special washings and sprays are being applied to protect young trees from borers and various insects. Weeds are removed as a safeguard from fire in connection with cultivation of the trees.

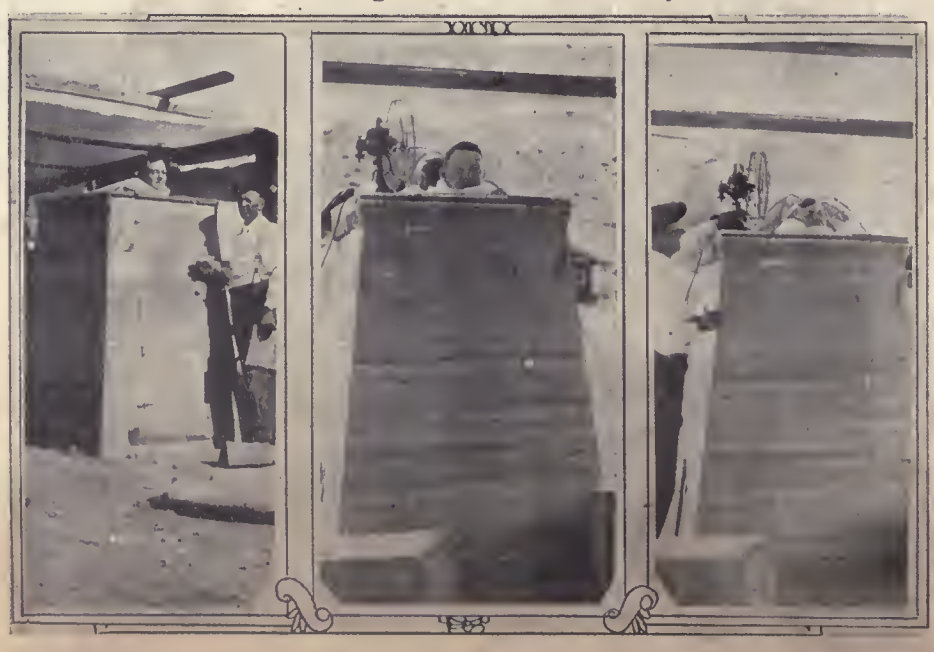
Experiments also are being made with a specially prepared paper mulch as a means of keeping down weeds and lessening irrigation costs.

Maintenance Superintendent William Reynolds has been active in caring for trees planted between Marysville and Roseville. Good reports also have been received from plantings in Tehama County and south of Chico, in Butte County. Exceptional progress is being made by trees planted in Merced County.

WE'LL SAY IT WAS THOROUGH

EQUIPMENT Engineer R. H. Stalnaker returned recently from a trip of inspection in Division IX in company with Maintenance Engineer A. J. Wagner and C. R. Blood of the Maintenance Department. They report a very interesting trip, including a flurry of snow at the summit of Tioga Pass and a thorough fumigation at Little Lake, Inyo County.

NO, READER, this isn't some new form of Turkish bath, it's three of our gallant highwaymen—Blood, Wagner, and Stalnaker—as they looked over in Inyo County when they were cleansed of any naughty hoof and mouth germs they might have hidden in the vest pockets. They fumed, but the man from Nevada had a big gun, so they decided they'd better be good and get fumigated. The fumigators were very considerate, though, they provided a fan so the boys wouldn't choke to death. Blood apparently doesn't mind it, but Stalnaker seems to be having a hard time. We are glad to report this fumigation is now a thing of the past.



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CALIFORNIA HIGHWAYS

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NATURAL ROCK GUARD RAIL IN THE KERN RIVER CANYON—Views on the Walker Pass route, east of Bakersfield, showing Division Engineer Woodson's natural rock guard rail. This guard rail is not costly and harmonizes with the rugged canyon.

On page five: NATURAL ROCK GUARD RAIL IN KERN CANYON.

California Highway Department

California Highway Commission

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R. M. MORTON, State Highway Engineer, Sacramento

PAUL F. FRATESSA, Attorney, San Francisco — W. F. MIXON, Secretary, Woodland

Headquarters Staff, Sacramento

T. E. STANTON, Assistant State Highway Engineer

FRED J. GRUMM, Office Engineer in Charge of Surveys and Plans

C. S. POPE, Construction Engineer

HARLAN D. MILLER, Acting Bridge Engineer

R. H. STALNAKER, Equipment Engineer

A. J. WAGNER, Maintenance Engineer

LOWELL R. SMITH, Purchasing Agent

HERMAN B. WEAVER, Chief Accountant

Division Engineers and Headquarters

T. A. BEDFORD, Division I, Willits

H. S. COMLY, Division II, Dunsmuir

G. R. WINSLOW, Division III, Sacramento

J. H. SKEGGS, Division IV, San Francisco

L. H. GIBSON, Division V, San Luis Obispo

J. B. WOODSON, Division VI, Fresno

S. V. CORTELYOU, Division VII, Los Angeles

E. Q. SULLIVAN (Acting), Division VIII, San Bernardino

F. G. SOMNER, Division IX, Bishop

J. C. McLEOD, Division X, Sacramento

General Headquarters, Fifth Floor, Forum Building, Sacramento

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JULY 1924

California Highways

VOL. 1 No. 7

ECONOMICAL PIPE CULVERT EXTENSION

By E. T. SCOTT, Maintenance Superintendent, Division VII.

AN ECONOMICAL plan for the extension of pipe culverts, without the destruction of headwalls, has been used successfully by Division VII, between San Diego and Oceanside, where widening and repaving of the state highway is under way.

A special maintenance crew was employed and headwalls for both corrugated and concrete pipe culverts were moved in record time by the use of a hoisting frame, designed and built at the division shops at Lankershim. This hoist consists of a ten-foot length of six-inch **I** beam, supported by four two-inch pipe legs, capable of adjustment to a height of six to eight feet.

A trolley carrying a two-ton Wright chain hoist was operated on the **I** beam, adjusted to move freely along the full length of the hoisting frame.

METHODS DESCRIBED.

Excavations were made around headwalls and down to the bottom of the footing and extended out from six to ten feet to provide room for moving. The excavation also extended from two to three feet back to permit disconnecting with concrete pipe or cutting corrugated metal pipe about a foot back of the headwall.

After cutting the pipe, the hoisting frame was lifted into place. The hoist chain was hooked on the back above the pipe and a turn taken around the top of the headwall, just below the offset. The headwall was then raised and moved out to its new location by means of the trolley.

Corrugated metal pipe extensions were fastened in place with two band couplings, while concrete extensions were made with two-foot sections of pipe laid with mortar in the usual manner.

FAST WORK CUTS COST.

Fifteen to thirty-five minutes was the time required for moving headwalls, varying in weight from 1800 pounds for the twelve-inch, to 3900 pounds for the twenty-four inch. The work included placing the hoist frame, and lifting and moving the headwall a distance of six to ten feet.

The average cost of moving thirty twelve-inch headwalls and extending corrugated metal or concrete pipe culverts was $5.15 for excavating and back filling; $1.35 for cutting pipe and moving cut headwall; and $3.25 for setting in pipe extension, making the total cost for extending one end of a twelve-inch pipe culvert $9.75.

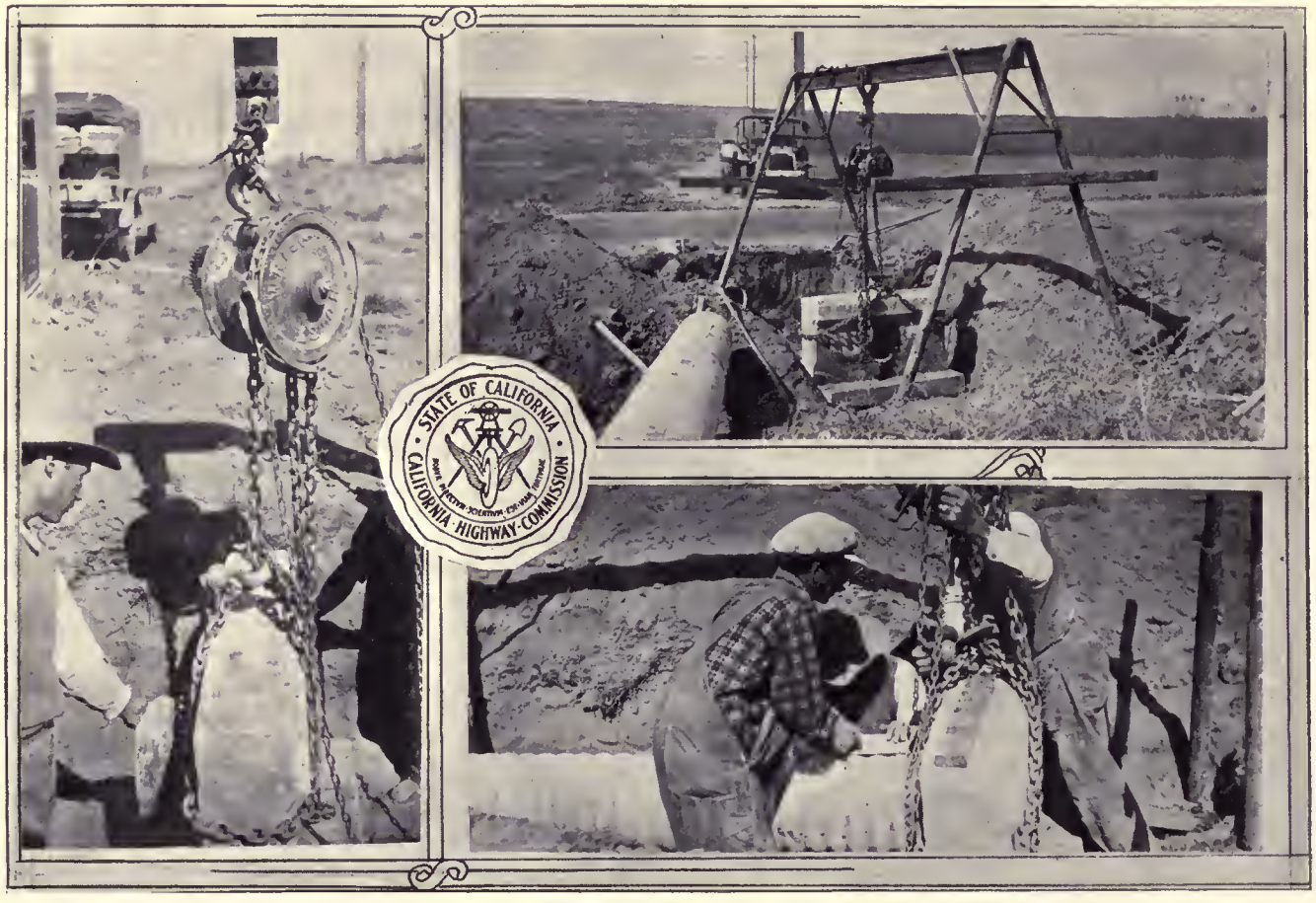
About twenty of the thirty of this size moved were of concrete pipe.

Headwalls for twelve eighteen-inch corrugated pipe culverts were moved an average of ten feet and the pipe extended at an average cost of $7.96 for excavation and back filling; $1.75 for cutting pipe, moving out and leveling up, and $2.74 for setting in the pipe extension, or a total of $12.46.

The average cost for eight twenty-four-inch corrugated pipe culverts, moved an average distance of seven feet and the pipe extended, was $12.60 for excavation and back filling, $2.85 for cutting pipe, moving out and leveling up, and $3.25 for setting in the pipe extension, making the total cost for extending one end $18.70.

(Continued on next page.)

NEW GRADE CROSSING WARNING—Plan being tried out in Division VI. Approaching a grade crossing at the northern entrance to Fresno, the warning is painted on the pavement at intervals for several hundred feet. Similar experiments are under way near Modesto, Division X. See story on Page Six.



ECONOMICAL CULVERT EXTENSION, DIVISION VII.—Upper right, hoisting frame, carrying a trolley with two-ton chain hoist, built at the Lankershim shops for moving concrete headwalls during culvert extension operations. Other views show the process of moving out the headwall and clamping of the pipe extension in place.

TRAFFIC MOUNTS UPWARD

ANNOUNCEMENT is made by the Maintenance Department that studies of the June traffic census, from stations in all parts of the state, indicate an increase of approximately 47 per cent over the figures for 1922, the date of the last census. This is the same increase as was recorded for the period between 1920 and 1922, and shows the traffic increase keeping pace with the increase in the number of motor vehicles.

June figures also showed a remarkable increase over April, due to the removal of quarantine regulations in almost all sections. Another census will be taken in August and at intervals of two months, indefinitely.

CHILEAN ENGINEERS VISIT STATE

THE state highway department early this month had the pleasure of entertaining Sr. Fermin Leon and Sr. Hector Vigil, highway engineers from the Republic of Chile, who were in the United States making a study of highways and construction methods.

Upon their arrival in San Francisco, the visitors were entertained by Chairman Harvey M. Toy of the highway commission. Fred J. Grumm, as special representative of State Highway Engineer R. M. Morton, accompanied the visitors on a tour over highways in the vicinity of San Francisco and Los Angeles.

PIPE CULVERT EXTENSION

(Continued from page 3.)

On the Los Angeles-Bakersfield highway, between Quail Lake and the Kern County line, a widening program is in progress. Headwalls on this work are being moved at approximately the same cost as those on the San Diego County job.

Here a two-ton Yale differential block is hung from a tripod made with three-inch pipe legs, each twenty feet long. The legs, and a **U** strap from which the block is hung, are fastened together with an inch bolt. For moving headwalls, the tripod is set so that the block hangs freely over the new location. As the headwall is lifted, it slides out to its final position.

The tripod hoist folds up and is easily moved from place to place. It is adaptable where headwalls are located on steep side slopes, but in level country the frame with the **I** beam trolley is preferable.

Howard C. Means, chief engineer, and Levi Muir, materials engineer of the Utah state highway department, recently completed an inspection of resurfacing and repaving of state and county highways in California.

NATURAL ROCK GUARD RAIL FOR MOUNTAIN ROADS

A GUARD rail consisting of stones blasted from the rocky walls of the canyons through which the roads have been constructed, and erected at a fraction of the cost of wooden guard rails, is being tried out on the Walker Pass highway and the Sequoia Park lateral by Division Engineer J. B. Woodson of Division VI.

"Two men stones," approximately 12 inches square at the top and 18 to 24 inches square at the base, 3 to 3½ feet long, have been placed at intervals of 6 to 7 feet along graded sections of the highway in the Kern River canyon and also between Three Rivers and the boundary of the Sequoia National Park. The stones are embedded in the ground to a depth of 12 inches and are placed along the edge of the road in the same location as a wooden guard rail.

Cost is Much Less.

The cost of procuring stones of the proper size and their erection averages $1 per stone or $880 per mile, as they are needed only on one side of the road. The cost of a continuous wooden guard rail in the same location, Woodson estimates at $7,920 per mile, hence a great saving in favor of the rock.

The heavy stones, under ordinary circumstances, will prevent a machine going off the road into the river, Woodson declares, pointing out that even if dislodged their weight probably would hold the average automobile.

In the Kern River canyon, the minimum width of the grade is twenty-two feet between the rock guard rail and the canyon wall and in most places it is wider. A wide highway also leads to the Sequoia Park.

The rock is of a light color granite plainly visible at night. Painting is declared unnecessary and would only inject the artificial into the natural colors of the conyon.

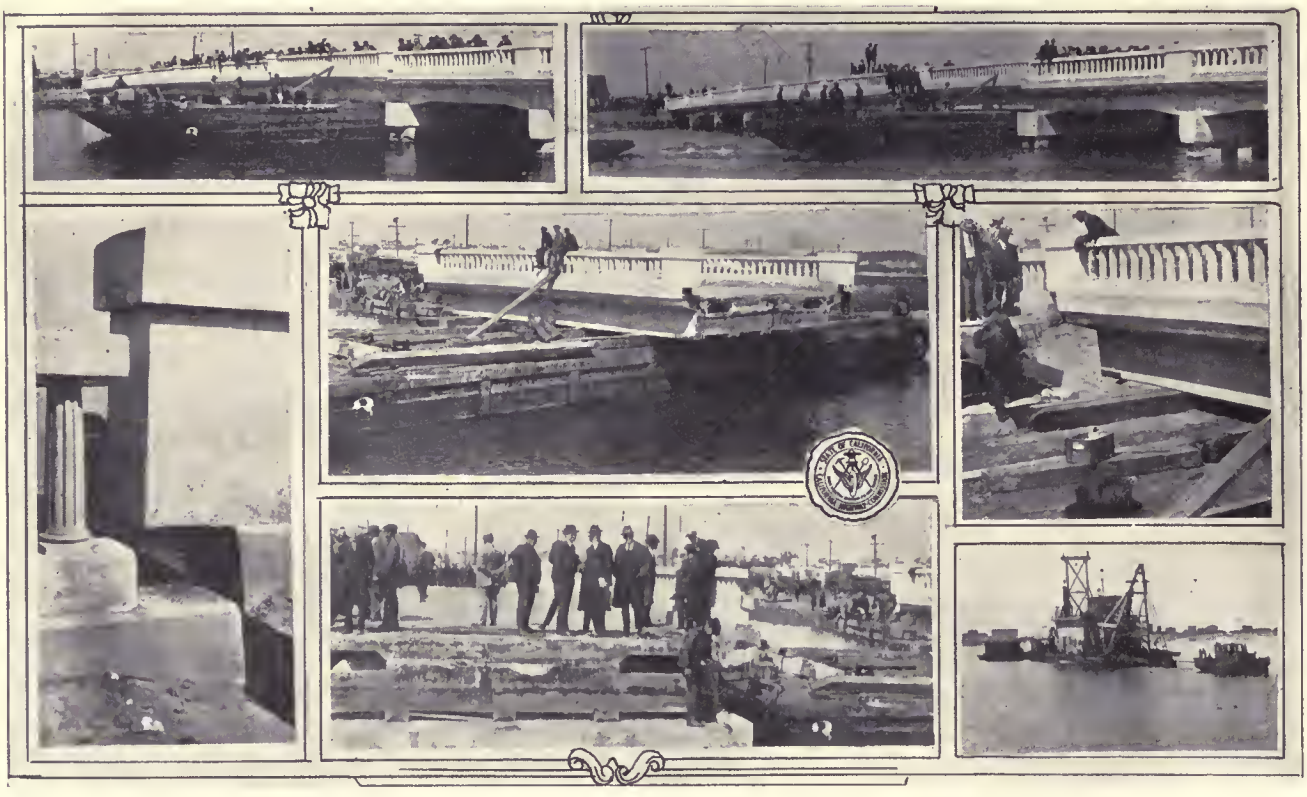
A somewhat similar rock guard rail is being installed on the Mount St. Helena highway and on other state highways in Division IV. (See front cover illustration.)

NEW STATIONS FOR DIVISION V

CONSTRUCTION of two new maintenance stations is now under way in Division V at Santa Maria and Buellton, both in Santa Barbara County. The California Highway Commission recently completed the purchase of a lot and residence in Santa Maria and the construction of a 30′ by 50′ maintenance warehouse on the property has been started.

A similar warehouse and storage building is being constructed at Buellton where the state has owned a site for some time.

OPENING LAKE COUNTY TO THE MOTORIST—Views of the recently completed Mount St. Helena State Highway between Calistoga, Napa County, and Middletown, Lake County, the pride of Division IV. This wonderfully scenic road climbs over the mountain with easy grades, taking the place of a steep and dangerous toll road, Lake County's only southern outlet in past years. (Photos by Assistant Division Engineer A. W. McCurdy.)



Using the tides to remove a span of the Alamitos Bay bridge, Los Angeles County.

HARNESSING THE TIDES TO OPEN A BRIDGE

IT was necessary, recently, to open the Alamitos Bay bridge, on the Coast boulevard, Los Angeles County, to permit the passage of a large dredge. The center concrete span had been constructed with this possibility in mind, and when the opening was requested, Division VII asked for bids for removing and replacing the span. An offer of approximately $7,500 was received, the state to assume all risk of damage to the bridge.

The bid was believed too high, and the division undertook the work which was successfully completed at an expense of about $500.

TIDE LIFTS SPAN.

A large barge was placed under the span at low tide and the span lifted from place as the water rose in the channel. It was then floated back and lowered into place as the tide went out.

The entire job was done with such dispatch that the bridge was closed to traffic only five hours. No damage to the bridge was reported, despite the fact that the span was 46′ 6″ by 26′ 10″ and weighed 168 tons.

Division Engineer S. V. Cortelyou, in his report to the state highway engineer, highly commends L. M. Ranson, assistant engineer on construction work, for his efficiency in planning and handling the removal of the span.

The pictures above show scenes before and during the removal of the span and while it was being returned to its place in the bridge.

NEW GRADE CROSSING WARNING TRIED IN SAN JOAQUIN

A NEW type of grade crossing warning is being tried out by the maintenance forces near Fresno, in Division VI, and in the vicinity of Modesto, in Division X. The warning consists of broad diagonal lines painted at intervals across the pavement at the approach to railroad crossings. Alternating with the diagonal lines, are painted in large letters the words "R. R. ×ing."

The lines are first placed about 500 feet from the crossing and are repeated several times so that it is almost impossible for a motorist to drive over them without his attention being forcibly called to the fact that he is approaching a railroad.

A Fresno County traffic officer has expressed the opinion that the warning painted on the pavement near Roeding Park, at the northern entrance to Fresno, has had considerable effect in slowing down the speed of vehicles at the crossing. A stranger remarked to a maintenance foreman that he believed the warning was the best he had ever seen.

The plan may be tried out elsewhere in the state if the results obtained justify the relatively small expense involved. (See illustration on page three.)

TWO ACTING DIVISION ENGINEERS GET PROMOTION

H. S. Comly and J. C. McLeod Now Have Rank of Grade Six.

AS THE result of recent civil service examinations successfully passed, H. S. Comly and J. C. McLeod have been given the rank of Grade Six and advanced to the position of division engineer. The promotion became effective July 1st, it is announced by State Highway Engineer R. M. Morton.

H. S. Comly

Comly's service with the state dates back almost to the beginning of state highway construction. It was in 1912 that he joined Division II as chief of party and since that time he has successively held the positions of resident engineer, assistant division engineer, acting division engineer, and now division engineer.

Before accepting a position with the state, Comly was employed by the Mexican National Railways and by the highway commissions of San Diego and Los Angeles counties.

McLeod From Oregon.

J. C. McLeod, the new chief of Division X, gained much of his experience as a highway engineer in the service of the Oregon Highway Commission. He held the position of division engineer in Oregon from 1917 to 1923 and prior to that time was engaged in railroad work.

J. C. McLeod

Mr. McLeod is a graduate of the University of Washington at Seattle. It has taken him but a few months to become a loyal Californian.

MUST STAMP PAVEMENTS

Specifications for concrete pavement on California state highways now require contractors to stamp the date and name of the builder at the beginning and end of each day's run. This will permit the public to know who the responsible builder in each instance was and also will permit engineers in the future to quickly determine the history of any particular piece of pavement.

Samples of the concrete mix are taken daily on all paving jobs for testing at the headquarters laboratory.

A rigid inspection of eating houses along the Coast and Valley state highways recently was made by the California State Board of Health.

In harmony with the program of power conservation in Southern California, Division VII has discontinued the lighting of the Newhall Tunnel.

FOREST CONTRACT LET

THE United States Bureau of Public Roads has let a contract for the grading of twelve miles from Patrick's Creek to the Oregon line on the Crescent City-Grants Pass road, in Del Norte County. H. H. Boomer of Spokane, Wash., was the successful bidder.

The section to be built, which eventually will become a part of the California state highway system, is the most northerly unit of the Redwood Highway in California. Funds for the construction of the unit will come from national forest appropriations.

Farther south, a section of the state highway between Trinidad and Fresh Water Lagoon, under contract for some time, has been opened to traffic and is now practically complete.

Widening Commended.

Users of the Redwood Highway have commended the work being done by state forces in Mendocino County, north of Willits, where a power shovel is moving 1,500 yards of material a day in connection with widening and straightening operations. The work is under the direction of Division I.

Today, more clearly than ever before, improvement of means of communication is one of the great forces making for cultural and economic advance.—*President Coolidge.*

DIVISION IX BUSY—Rock crushing plant of Division Engineer F. G. Somner getting out surfacing material for a section of the state highway in the Sherwin Hill district, Mono County.

$9,025,247 is Total of Contracts Awarded by California Highway Commission January 9, 1923, to July 16, 1924

STATE HIGHWAY FUND CONTRACTS (Bond Funds, including Federal Aid)

Cont. No.	Division	County	Route	Sec.	From	To	Miles	Type	Contractor	Estimated cost	Date Contract approved by Attorney General	Contract time, days
420*	IV	Sonoma	8	B	Arroyo Seco Creek Bridge			Reinforced Concrete Bridge	Davison & Nicholson	$14,040 35	June 26, 1923	92
421*	VII	Los Angeles	9	G	Fish Canyon Road	Azusa	.97	Grading and 24'x7'' Concrete Base	W. D. McCroy	43,535 01	June 26, 1923	114
422*	IV	San Mateo	55	B	Across Crystal Springs Dam		.11	Reinforced Concrete Girder Bridge	J. H. Shepherd	51,865 44	July 24, 1923	135
423*	IV	Sonoma	1	A	Near Lytton		.20	24' Grading, 18'x6'' Gravel Surfacing	Tieslan Brothers	11,870 05	Aug. 4, 1923	69
424*	I	Del Norte	1	A & B	Across Wilson Creek			Reinforced Concrete Girder Bridge	C. H. Gildersleeve	8,851 97	Aug. 29, 1923	76
425*	IV	Santa Clara	32	A	5 miles east of Gilroy	San Felipe	4.52	Grading and Gravel Surface	J. P. Holland	104,321 93	Sept. 6, 1923	95
426	VIII	Riverside	26	D	Across White Water River		.53	Reinforced Concrete Bridge	Gibbons & Reed	136,475 87	Sept. 8, 1923	135
427	II	Lassen-Plumas	29	A	3 miles east of Chester	3 miles east of Westwood	12.66	Gravel Surface	T. H. & M. C. Polk	70,053 65	Oct. 13, 1923	250
428	VII	Los Angeles	23	B	Santa Clara River Bridge	1-5 mile easterly	.19	Concrete Base	H. E. Cox	13,086 72	Nov. 20, 1923	48
429	VIII	Riverside	26	A	In the city of Beaumont		.73	Asphalt Concrete Pavement	Southwest Paving Co.	23,041 15	Dec. 10, 1923	33
430	VIII	Imperial	26	A	Westmoreland	4 miles west	3.93	Grade and Gravel Surface	Pioneer Transfer Co.	50,704 10	Dec. 10, 1923	100
431	II	Shasta	3	B	Redding	Bayha	9.88	Concrete Base	Kaiser Paving Co.	478,414 87	Dec. 29, 1923	250
432	III	Nevada	38	A	Truckee	Boca	7.22	Grading	Irey & Holden	85,905 79	Jan. 24, 1924	300
433	IV	Sonoma	51	B	Beltane	Schellville	11.50	7.23 miles Grade and Gravel Surfacing—4.27 miles Concrete Base	Galbraith & Janes	304,401 02	Jan. 26, 1924	250
434	II	Tehama	3	D	Los Molinos	Red Bluff		Six Reinforced Concrete Bridges	McKenzie & Pollard	58,766 31	Jan. 24, 1924	300
435	VII	Orange	60	A & B	Huntington Beach	Corona Del Mar	8.20	8.20 miles Grading—3.52 miles Concrete Base	W. F. Beal	208,302 89	Jan. 30, 1924	200
436	V	Monterey	2	F	Across San Lorenzo Creek			Reinforced Concrete Girder Bridge	Rocca & Caletti	32,629 61	Jan. 30, 1924	275
437	IV	Santa Clara	32	B & C	Across Cedar Creek and North Fork Pacheco Creek			Reinforced Concrete Bridges	John Simpson & Co.	46,617 51	Feb. 29, 1924	150
438	VIII	Imperial	27	B	Sand Hills	Colorado River	14.05	Grade and Gravel Surface	Kisselburg, Schmidt & Hitchcock	208,111 50	Mar. 3, 1924	200
439	IV	San Mateo	55	C	Halfmoon Bay Road	La Honda Road	12.36	Grade and Gravel Surface	J. P. Holland	573,064 60	Mar. 24, 1924	175
440	I	Humboldt	1	F	Across Van Duzen River near Alton			Reinforced Concrete Bridge	Bordwell & Zimmerman	98,555 00	Apr. 23, 1924	250
441	II	Lassen	27	C & D	Janesville	4 miles west of Milford	9.71	Gravel Surface	Warren Construction Co.	52,713 10	May 5, 1924	200
442	III	Placer	37	C	¾ of a mile north of Colfax	Gold Run	8.03	Grading	C. R. Adams	337,427 24	June 20, 1924	450
443	I	Del Norte	1	A	Klamath River Bridge			Reinforced Concrete Bridge	F. Rolondi	430,914 00	July 8, 1924	450
446	III	Nevada	38	A	Across Truckee River about 1 mile north of Polaris			Reinforced Concrete Bridge	Proctor & Cleghorn	55,467 50		150
444	I	Humboldt	1	G & H	Eureka	Arcata	6.45	Concrete Pavement	J. F. Knapp	267,809 85	July 17, 1924	150
445	III	Nevada	38	B	Boca	Floriston	5.32	Grading	Irey & Holden	274,280 56		300
						Subtotal	116.56			$4,041,227 59		

*Completed.

MOTOR VEHICLE FUND CONTRACTS (Including Gasoline Tax Fund)

M-24	V							Painting Bridges, Coast Highway	D. E. Burgess	$50,030 50	Aug. 29, 1923	120
M-25*	IV	San Mateo	2	A & B	San Bruno	Bersford	5.13	Concrete Shoulders and Asphalt Surface	Pacific States Const. Co.	316,042 03	Aug. 28, 1923	141
M-26*	III	Placer	3	A	Roseville	Lincoln	1.06	Concrete Shoulders and 2d Story	Kaiser Paving Co.	35,387 66	Sept. 14, 1923	70
M-27*	X	San Joaquin	5	A	Westerly bonndary	Banta	8.07	Broken Stone Shoulders	Irey & Holden	44,423 45	Sept. 17, 1923	130
M-28	V	San Benito	67	A	1-5 mile south of San Benito River	Pajaro River Bridge	3.04	Grading and Asphalt Macadam Surface	Granite Constructioo Co.	100,804 61	Sept. 20, 1923	180
M-29	I	Mendocino-Humboldt			Route 1			Painting 17 Bridges	Chas. L. East	12,285 31	Nov. 6, 1923	135
M-30	III							Painting 5 Bridges	Jenkins & Elton	8,291 80	Nov. 20, 1923	90
M-31	V	Monterey	2	I	Bridge across Salinas River at Nacimiento Statioo			Floor Repairs	Theo. M. Maino	21,836 87	Nov. 20, 1923	90
M-32	II	Siskiyou	3	C	Hornbrook	Yreka	11.00	32,340' Guard Rail	Calvert & Calvert, Schroeder & Pearce	28,103 46	Dec. 1, 1923	100
M-33	II	Siskiyou	3	C	¼ mile north Shasta River	Oregon Line	14.30	Grade and Gravel Surface	Dunn & Baker	355,395 90	Dec. 5, 1923	150
M-34	VII	Los Angeles	4	D	Quail Lake	Northerly boundary	10.43	Grade and Widen Roadbed	Williams & Singletary	55,248 76	Jan. 17, 1924	150
M-35	X	Sacramento	4	B	McConnell Station	Sacramento	13.03	Concrete Base	Kaiser Paving Co.	444,490 71	Jan. 17, 1924	200
M-36	VII	San Diego	2	A & B	San Diego	Oceanside	17.14	Concrete Base	Jahn & Bressi	533,913 55	Jan. 24, 1924	250
M-37	II	Shasta	3	B & C	Bayha	Halfway Creek	9.92	Grade and Gravel Surface	Nevada Contracting Co.	571,987 93	Jan. 21, 1924	300
M-38	X	Sacramento	4	A	Southerly boundary	Galt (R. R. crossing)	1.89	Concrete Base	Kaiser Paving Co.	73,144 52	Jan. 21, 1924	90
M-39	VII	Los Angeles	2	B & C	Shoup Avenue	Westerly bonodary	13.06	Grade and 11.56 miles Concrete Slab and Shoulders	Geo. H. Oswald	435,897 22	Feb. 4, 1924	200
M-40	VII	Ventura	2	A & B	Southerly boundary	Camarillo	13.50	Grade and 7.4 miles Concrete Slab and Shoulders	Sam Hnoter	355,608 08	Apr. 3, 1924	200

M-41	IV	Santa Clara	5	A	Milpitas	Coyote Creek	3.72	Waterbound Macadam Shoulders and Asphalt Concrete Surface	Federal Paving Co.	96,202 30	Apr. 11, 1924	90
M-42	VII	Los Angeles	2	D	Pasadena Avenue	Montebello	2.78	Concrete and Asphalt Surface	Geo. H. Oswald	202,249 85	Apr. 29, 1924	150
M-43	X	Sacramento	4	B	Old Elk Grove	Sacramento		Twelve Bridges	T. H. & M. C. Polk	44,109 05	May 9, 1924	100
M-44	X	Solano	7	D	Vacaville	Batavia	8.29	Concrete and Asphalt Pavement	Force & Curtigan	240,579 35	May 27, 1924	175
M-45	VII	Orange	2	A	Easterly boundary	San Juan Bridge	9.45	Widening Roadway	Williams & Singletary	29,972 60	June 4, 1924	150
M-46	IV	Marin-Sonoma	8	A	Across Petaluma Creek			Painting Bridge	Jenkins & Elton	5,244 80	June 24, 1924	60
M-47	IV	Contra Costa	14	A	Garrity Creek Bridge			Reinforced Concrete Bridge	John Phillips	4,229 50	June 17, 1924	60
M-48	I	Lassen	29	C	Susanville	Johnstonville	4.54	Asphalt Macadam Pavement	T. H. & M. C. Polk	52,449 76	June 23, 1924	120
M-49	IV	San Mateo	2	B	Redwood City	Southerly boundary	3.46	Shoulders and Asphalt Concrete Surface	Freeman & Whiting	128,028 02	June 23, 1924	120
M-50	X	Sacramento-San Joaquin	4	A & D	Dry Creek Bridge			Floor Repairs and Painting	M. B. White	16,777 20	June 16, 1924	100
M-51	II	Shasta	3	A	Olney Creek, Clear Creek and China Gulch Bridges			Painting Bridges	J. A. Mohr & Sons, Inc.	5,310 80	June 20, 1924	90
							4.33	Portland Cement Concrete Shoulders	W. A. Dontonville	57,060 12	June 23, 1924	75
M-52	IV	Alameda	5	A	Livermore		1.20	Sea Wall	The J. H. Tillman Co.	420,312 75	June 23, 1924	500
M-53	VII	Ventura	2	F & G	Rancho El Rincon		3.96	Gravel and Portland Cement Concrete Shoulders	Tibbals, Percival & Cress	46,692 82	July 8, 1924	90
M-54	X	Solano	7	B	Fairfield			Reinforced Concrete Bridge	Rocca & Caletti	5,062 20	July 14, 1924	75
M-55	V	San Benito	67	A	San Juan Creek Bridge		8.07	Asphalt Concrete Pavement	Valley Paving & Const. Co.	186,841 71	July 17, 1924	120
M-56	X	San Joaquin	5	A	Westerly boundary	Banta						
							171.37			$4,984,020 19		
							287.93					
						Grand total				$9,025,247 78		

NOTE.—This total does not include special appropriations for cooperative forest highway projects, work under way by state forces, maintenance expenditures or prison road camp activities.
*Completed.

IN MEMORIAM

EDWARD A. ARAUJO

March 16, 1895—June 20, 1924.

ON SUNDAY, June 22, the Construction Department received the sad news of the death of Edward A. Araujo, who passed away at his home in Sacramento on the previous Friday evening from a heart attack. He was about his work as usual Friday afternoon and gave no indication that he felt the slightest illness.

EDWARD A. ARAUJO

Mr. Araujo was born in Santa Margarita, San Luis Obispo County, and spent his early years on his father's ranch.

In 1915, he decided upon engineering as a profession, and engaged in this work in and about Atascadero. Following this experience, he came to Sacramento to accept a position with the county highway organization where he first became acquainted with the present state highway engineer, R. M. Morton. He served under Mr. Morton and also under Mr. W. S. Caruthers.

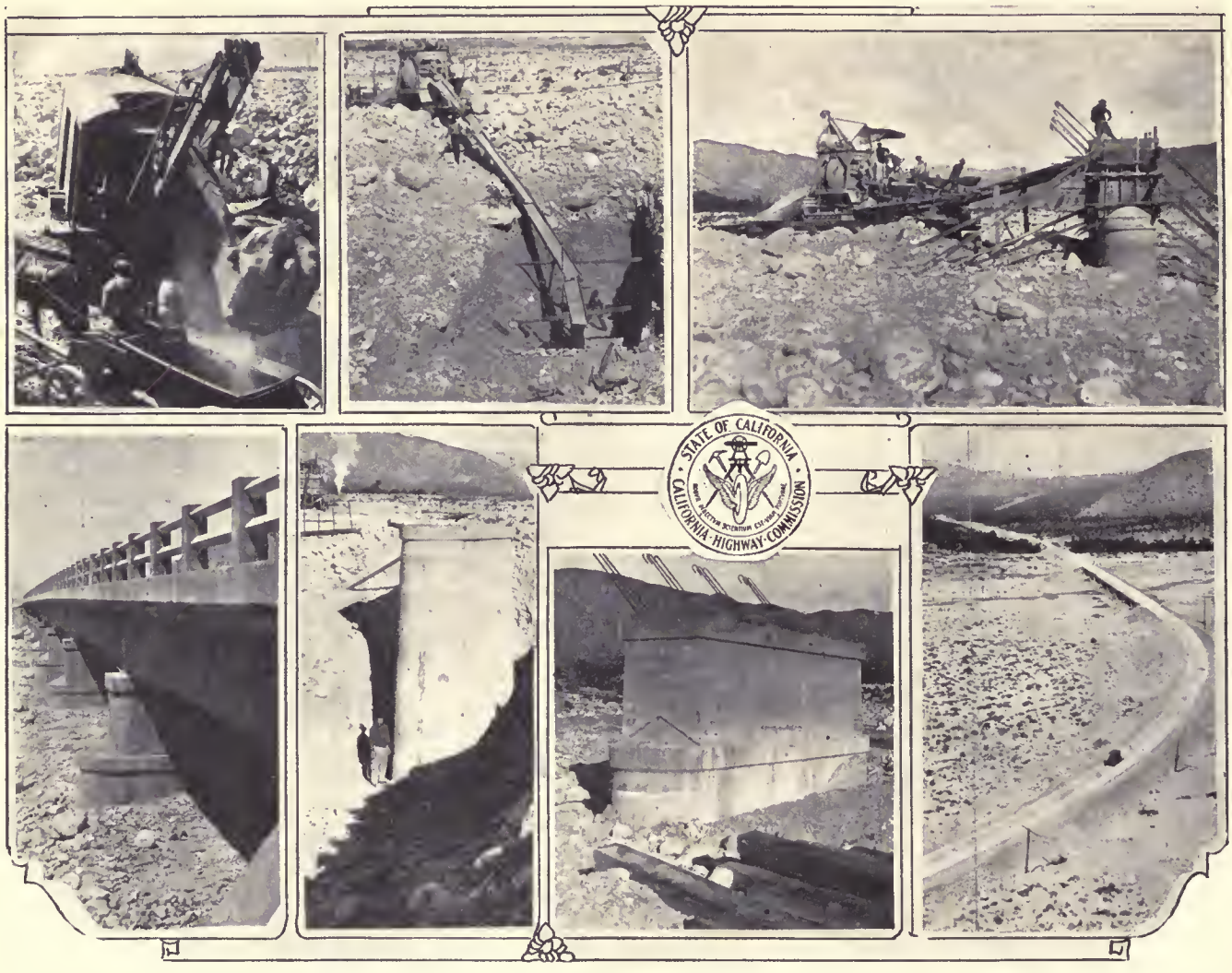
In 1918, Mr. Araujo acted as an assistant superintendent of construction at Mather Field, near Sacramento. Following this, he entered the Students' Army Training Corps at the University of Nevada where he remained until 1919, when he returned to Sacramento County.

From January, 1923, to the time of his death, Mr. Araujo was attached to the construction department of the state highway commission. He assisted in numerous important investigations, including soil and traffic studies, analyses of cost data, and matters relating to the control and apportioning of state highway funds. His last work was in connection with laboratory tests for the curing of concrete pavement with calcium chloride. This work was being organized at the time of his death.

It is with deep regret that the head of the department gives this brief review of the life of a man who seemed so necessary to the work he was doing and to the many friends he has left. In the course of a number of years of experience with men, there have been few instances in which the writer has had under his direction a man of such sterling loyalty and unusual cheerfulness of disposition. The vivacity, active spirit, friendliness, and ideals of conduct of Edward Araujo brought him the friendship and confidence of all those with whom he came in contact.

The Highway Commission in his death has lost a most worthy employee and his friends, a friend whom it will be difficult to replace.

C. S. POPE.



BUILDING A BRIDGE IN THE DESERT—Views showing various stages in the construction of the Whitewater River bridge on the Imperial Valley trunk line, Riverside County. The upper left shows the rather unique operation of a steam shovel excavating for a pier. The upper center view shows preparations for pouring concrete for one of the piers, while the completion of the capping is shown at the right. The lower views show a section of the completed bridge; a completed pier, indicating its depth below the bed of the stream; steel reinforcing for anchoring the pier to the superstructure of the bridge, and a general view of the completed bridge, showing wide sweep of the approach. Whitewater River is now practically dry but at times it is a raging torrent. (Photos by Division VIII.)

PLANS FOR $2,000,000 IN NEW BRIDGES ARE APPROVED

THE importance which bridge construction has assumed recently in the state highway department is emphasized by the announcement that, since January 1st, State Highway Engineer R. M. Morton has approved for contract nearly $2,000,000 worth of bridge and structural work, plans for which were prepared by the bridge department.

Included in this total, are plans for some fifty-five structures, including the large Douglas Memorial Bridge in Del Norte County, Van Duzen bridge in Humboldt County, the Ventura seawall, and groups of bridges in Sacramento, Tehama, and other counties. Plans for the construction of twenty-four bridges prepared by counties and the bureau of public roads also have been checked and approved, the cost of which will aggregate probably $700,000.

The total approved for contract since the beginning of the year is several times the amount of bridge work approved in any similar period since the beginning of state highway construction in California.

Assistants Named.

Acting Bridge Engineer H. D. Miller, since the reorganization of the department to include supervision of bridge construction, has named several assistants to aid him in directing the work.

F. W. Haselwood, formerly assistant division engineer in Division I, has been placed in charge of all railroad grade crossing elimination work. He also will represent the state highway engineer on the recently created grade crossing committee, fostered by the California State Automobile Association.

Stewart Mitchell, formerly assistant bridge engineer of the Oregon State Highway Department, has been appointed assistant bridge engineer, following a recent civil service examination. He will be in charge of the construction of the $400,000 Memorial bridge over the Klamath River.

D. C. Willett also has been appointed assistant bridge engineer. He will continue to act as office engineer.

L. D. Packard, formerly with Division VII, has been chosen to assist Mr. Miller in the supervision of bridge construction in the field and will have direct charge of certain portions of this work.

WILL TAX BILLBOARDS

MASSACHUSETTS will hereafter put a tax on the highway sign even though erected on private property. The contention is that the value of the sign is derived from the public highway, not from the private property on which it is located, and that the first obligation is to the public who owns the highway and gives the sign an advertising value. Permission from the landowner is a secondary matter.

It would be well for other legislatures to extend the Massachusetts idea and give the highway authorities some control over all signs erected on private property that in any way derive their value from their location as regards a public highway. This is the only way that the highway officials can keep any control over the sign and billboard nuisance along the public highways.—*Good Roads Magazine.*

HOW LONG WILL TIMBER LAST?

From the News Letter of the Wyoming State Highway Department.

The question is frequently raised as to the durability of timber when left in the open.

Georgia Highways carries an illustration showing a wooden head board of a grave in old Midway Cemetery in Liberty County, Georgia. The board is of black heart cypress timber and bears the date "Anno Domine 1770."

The carving was done by hand, and the somewhat unusual shape of the letters would indicate that the head board was made during the latter part of the 18th century. It has been constantly exposed to the elements since that time.

HIGHWAY PUBLICATIONS

Twenty-five states now get out monthly or weekly publications in the interest of highways. Arkansas, California, Florida and Utah have recently added interesting publications to the monthly list. All states are beginning to realize the urgent need for a publication of this kind in order that the people may be kept informed with accurate and reliable information regarding the activities of the state highway department. Such publications are both interesting and instructive. We congratulate these last four states on this forward step. *Texas Highway Bulletin.*

It is estimated that 10,000 automobiles carrying 40,000 motorists visited the Big Bear country in the San Bernardino Mountains during the July 4th week end. All records were broken for traffic over the Crest Route state highway.

"While as transportation facilities increase and transportation costs grow lower and cheaper, industry thrives, markets widen, commerce grows and wages increase by leaps and bounds."—Guy M. Walker in "Measure of Civilization."

The Truckee summit, on the Victory highway, was opened to travel May 5th and the Myers summit, on the Lincoln highway, opened April 30th. This is the earliest these roads to Lake Tahoe have been opened for many years.

Sprinkling of the highways east of Auburn and Placerville began weeks ago, owing to the dry condition of the mountains.

A UNIQUE HONEYMOON

TOM MENDENHALL, employee of the service department of the headquarters shops, who has been the mechanic in charge of the cars used by the Committee of Nine in its inspection trips about the state, made such a hit with committee members that they refused to let him have time off for a honeymoon.

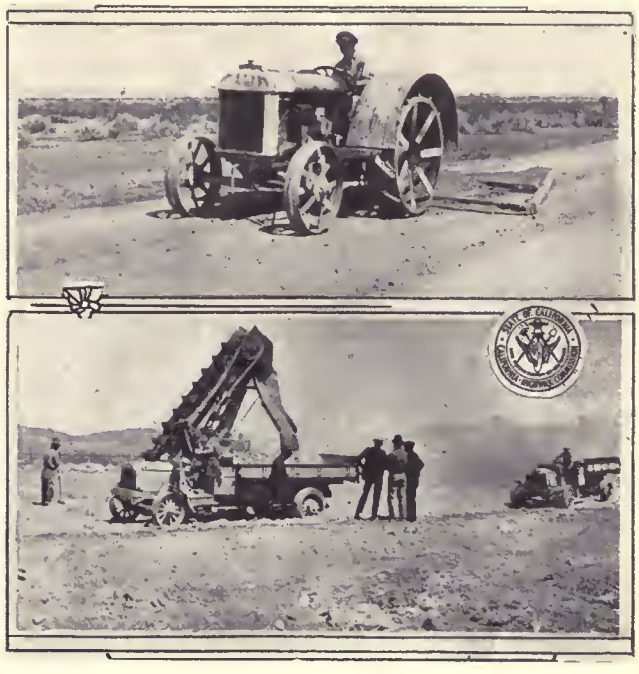
Tom and his bride of a few days were in Santa Cruz when the committee got ready for its trip over the Redwood Highway. A telegram was sent Tom and he was finally persuaded to bring his bride along.

When Mrs. Mendenhall, who was formerly Miss Maude Schillinger of Sacramento, arrived home eight days later, she had traveled some 1,500 miles over some of the best and some of the worst roads in the state. She had been an honored guest at a prison road camp and heard more about highways than some folks do in a lifetime.

She declared, however, she had a "wonderful time," even if there were fifteen men in the party, fourteen besides her hubby.

FRENCH ENGINEER ON VISIT

California highways and bridges were given considerable study recently by B. B. Gaspark, engineer connected with the engineering department of French Indo-China, while on a six months' leave of absence from his post in the Far East. While here, he asserted the fame of California highways has gone around the world and predicted that engineers from all nations will come here to study the state's successful methods.



IMPROVING THE NATIONAL OLD TRAILS HIGHWAY—Views of maintenance work under way on the Barstow-Needles connection with northern Arizona, through San Bernardino County. The upper view shows a drag at work, and, below, a loader is hoisting gravel into a truck for use as surfacing material. Much praise has been accorded this work which is being carried on with a comparatively small expenditure of funds. (Photos by Division VIII.)

BEDFORD PROPOUNDS SOME IDEAS ON ROAD BUILDING

By T. A. Bedford, Division Engineer, Willits.

THE highway engineer of today has a problem new to him but old to the railroad engineer.

If every automobile contained only the driver, we might say, "let him break his neck;" but there are so many innocent passengers, who are in no way responsible for the carelessness or recklessness of the driver, that the highway engineer must do his utmost to keep the cars on the road.

T. A. Bedford

To do this, he must have good alignment, wide roadways, open views, easy curves properly banked, and the dangerous places protected by a guard rail which machines can not go through.

We have a fast moving traffic which refuses to slow down for our *Danger* signals; we must remove as much of the danger as possible; we must provide as safe a roadway as possible and means to keep traffic on the road. A wreck on the road is never so disastrous as a wreck at the bottom of a cliff or embankment.

YOU'RE RIGHT, BEDFORD.

Yes, "You have to move dirt to build a road," also houses, barns, and even wells, and pay dearly for the privilege. Some small towns had better be moved to the highway.

A first class set of plans has a few houses and barns on the center line and a few small towns off of it. It takes a "leather legged" engineer and not a "feather legged" engineer to do this.

He needs the protection, for the dogs bite as he goes through the back fence, and politicians howl.

Somebody has got to do it some day, and the sooner the better.

The engineer who has not the nerve to do these things should go west.

"Straight is the path—and broad is the way" that leadeth not into the ditch.

SHOP WORK COMMENDED

AUTOMOBILES operated by employes of the state department of agriculture, along with those of other state departments, are repaired and serviced at the shops of the highway commission in Sacramento.

The following is quoted from a letter of one of the officials of the agricultural department to the head of the equipment department of the highway commission:

> The Chief of my Division wishes me to take this opportunity to express to you our appreciation and satisfaction with the work done at the Highway Shops on the cars operated by us. We believe that the present arrangement of having repair work done by your Commission has worked out not only more economically but more efficiently than the old system.

DEL NORTE COOPERATES

AS A RESULT of recent action by the Del Norte County Board of Supervisors, Division I is in possession of a thirteen acre tract, on the highway just north of Crescent City, upon which a maintenance station will be established. The state has been given a free lease to the property without restrictions, for a period of ninety-nine years.

Division Engineer T. A. Bedford is enthusiastic over the action of the Del Norte supervisors in giving up a portion of the county fair grounds as he has been endeavoring to secure a desirable site for a maintenance yard in Crescent City for some time.

Maintenance Funds Also.

Del Norte County also has advanced the state highway commission $8,000 for maintenance work on the Crescent City-Grants Pass highway. The contribution was made voluntarily and is more than Del Norte's share of the state motor vehicle fund. Surfacing of a section of the road with crushed rock is now underway.

SPREADING CALCIUM CHLORIDE—Methods used in Division IV to spread calcium chloride on the Skyline boulevard, south of San Francisco. This chemical absorbs moisture from the air, binding the surface of the road and lessening the dust.

DIVISION IV EXPERIMENTS

IN cooperation with the Whitney Chemical Company, the maintenance department of Division IV is making a series of experiments with substitutes for calcium chloride on a three-quarter mile section of the Skyline boulevard. Tests are being made with magnesium chloride crystals and a magnesium chloride liquid donated by the Whitney Company.

One unit has been treated with the salt, another with the liquid, and a third with sodium chloride. The division reports that indications are favorable for the magnesium chloride liquid test. If the result appears to justify it, additional tests will be made.

The end sought is a reduction in the cost of this type of maintenance. The tests are indicative of the desire of the engineering department not to overlook opportunities to try out new methods which may prove a more economical and efficient means of carrying on the highway work.

WHAT THE DIVISIONS ARE DOING

Park Roads Improved.

DIVISION IV reports present available funds will complete about half the improvement planned on the roads in the California Redwood park, in Santa Cruz County, now under the jurisdiction of the highway commission. A state-owned power shovel is at work on the job.

Widening of the Santa Cruz road at two old county bridges between Glenwood and Santa Cruz has greatly improved the safety of this route.

Division IV has been widening the Redwood Highway between Cloverdale Hill and the Mendocino County line. Calcium chloride has taken the place of sprinkling with satisfactory results.

J. P. Holland has been granted an extension of his contract for grading on the Skyline Boulevard and soon will be at work between Half Moon Bay Road and La Honda Road.

Convicts Transferred.

For the first time in many years, Division II is without a prison road camp. The last contingent of the Schilling camp has been moved to the Kern River canyon, east of Bakersfield, in Division VI, for work on the Walker Pass highway. A modified construction program is being continued on the Trinity lateral, where the prison camp work was discontinued.

Polk and Polk have started work on 4½ miles of asphalt macadam paving east of Susanville, in Lassen County. Surfacing of recently completed grading, both east and west of Susanville, also is underway.

Shortage of water compelled the Kaiser Paving Company to place ten miles of pipe line to continue paving operations north of Redding which are again underway. Widening operations in the Sacramento Canyon are progressing rapidly, the work going ahead night and day.

Shovels on the Job.

C. R. Adams of Merced, recently awarded the contract for grading between Colfax and Gold Run, Placer County, has two power shovels on the job, reports Division III.

The famous "Joy bump," on the Eastside Highway near Gridley, Butte County, has been removed by state forces.

The Folsom highway, between the Sacramento city limits and Brighton, has been reshaped and surfaced with asphalt concrete pavement.

Division III has plans and specifications ready for several large contracts on the Nevada connection, east of Auburn, and also for several specific maintenance and betterment jobs, all of which are awaiting additional funds before the work can go ahead.

Gravel Shoulders in Salinas Valley.

Division V has a comprehensive program under way for the placing of eighteen miles of gravel shoulders along the pavement between Soledad and King City, in Salinas Valley. Work of this nature already completed indicates that water-bound quarry waste, properly bound and rolled, gives better results than oiled rock shoulders, taking into consideration the expenditure involved and the particular materials available.

The shoulders add to the safety of the fifteen-foot pavement and will provide an excellent subbase for a future second story pavement.

Reflooring of the Nacimiento River bridge, between Bradley and San Miguel, Monterey County, has been completed. Timber surfaced with asphalt was used. The good gravel detour through the dry river bed maintained during construction brought favorable comment from the traveling public.

Survey Resumed.

Division VI has resumed work on the survey of the proposed Madera-Yosemite highway, provided for by a special appropriation of the 1921 legislature.

Contractor W. S. Mead has completed the first 7½ miles of the Kern River canyon highway, in Kern County, and a Folsom prison road camp is at work on the second unit. Headquarters have been established at Rich Bar.

Rincon Seawall Under Way.

Division VII joins with the people of Ventura and Santa Barbara in rejoicing over the commencement of construction on the Rincon seawall and fill along the Ventura Coast. The J. H. Tillman Company of Portland, Oregon, contractors, has begun operations and plans to rush the work as fast as possible. This company has handled other similar jobs and is prepared to carry the construction forward on an extensive scale. Traffic will be handled over the present trestle.

Grading has been begun by Williams and Singletary on nine miles of shoulder work in Orange County.

Test wells have been dug to determine foundation conditions at various bridge sites along the Coast Boulevard route through the Malibu Ranch, north of Santa Monica, in Los Angeles County. Grading operations on this section are under way by state forces.

Rough grading has been completed and culverts installed between Promontory Point and Corona Del Mar, on the Coast Boulevard, in Orange County, and grading is now in progress between the Newport Road and Huntington Beach.

Twenty men and a gas shovel are making progress on the southern end of the Ridge Route where the alignment on blind curves is being improved. A fleet of dump trucks is operated in connection with the shovel.

New Grade Sprinkled.

Heavy trucking over the new grade in the vicinity of Westmoreland, Imperial County, during the cantaloupe season, threatened damage to the crushed rock surfacing. A telegram to headquarters brought a sprinkling truck and the road was kept watered and in good condition. The division commends the efficient control of equipment.

To Try new Asphalt Spreader.

A new device for spreading asphalt concrete, designed to eliminate considerable hand labor and speed up handling of hot asphalt mix, will be tried out by Force and Currigan, contractors on the Vacaville-Batavia widening and thickening contract, it is announced by Division X. Paving will be begun by August 1st.

The Kaiser Paving Company hopes to complete the paving contract south of Sacramento in time for the opening of the state fair.

Progress is being made on line and grade revisions on the highway between Silver Mountain and Markleeville, in Alpine County.

Permanent camps for maintenance forces have been completed on the Carson Pass Road near Corral Flat and on the Sonora-Mono road at Baker's Station. Near the latter point, a new unit of road has been constructed to take the place of one destroyed last winter by a cloud-burst.

A considerable portion of the Big Oak Flat road has been surfaced from a crushing plant established near Second Garrotte.

"THAT THE PUBLIC MAY KNOW"—One of the signs erected in Division IV to inform the public concerning highway construction under way in Sonoma County.

CALIFORNIA HIGHWAYS

OFFICIAL PUBLICATION OF THE

CALIFORNIA HIGHWAY COMMISSION

SACRAMENTO, CALIFORNIA

HARVEY M. TOY, Chairman;

N. T. EDWARDS and LOUIS EVERDING, Commissioners.

ROBERT M. MORTON, State Highway Engineer.

W. F. MIXON, Secretary.

We are pleased to permit publication of any of the matter contained herein and this privilege is extended newspapers and periodicals without restrictions.

FRANK B. DURKEE - - - Editor

P. O. Box 1103, Sacramento, California.

Vol 1. JULY, 1924 No. 7

JUST AMONG OURSELVES

☆ ☆ ☆

HIGHWAY NEWS NOTES

Stanton is Speaker.

ASSISTANT State Highway Engineer T. E. Stanton was a speaker before the national convention in Pasadena of the American Society of Civil Engineers. He discussed a recent paper of Dr. L. E. Hewes of the United States Bureau of Public Roads on the "Development of Highway Traffic in California."

C. S. Pope, construction engineer, addressed a meeting of the Sebastopol Chamber of Commerce on July 14th on the subject of highways, representing Mr. Morton.

Higher standards of construction on California state highways were discussed recently by Chairman Harvey M. Toy and Division Engineer J. H. Skeggs before a meeting of the Purchasing Agents' Association of Northern California.

Bridge Department Notes.

L. D. Packard, recently from Southern California, has joined the staff of the bridge department at headquarters.

Stewart Mitchell, until recently connected with the Oregon state highway department, is now among the tall timber along the Klamath River in Del Norte County where he will act as resident engineer on the construction of the Klamath River Bridge.

E. L. Nelson, resident engineer on the Klamath River piling job, recently sent in a receiving record for a nine-pound son. Headquarters sends best wishes.

Takes June Bride.

Paul C. Ricks, of the Division I drafting force, took Miss Lilas M. Cole of Willits for his bride during June.

E. W. Roberts of Division I is reported stepping high since the arrival of a daughter in his home on June 26th.

R. P. Hamlin, superintendent of the division shops at San Luis Obispo, was a visitor at the Willits office early in the month.

Comly Visits Old Home.

H. S. Comly, division engineer at Dunsmuir, recently enjoyed a two weeks vacation at his old home in San Diego.

Division I reports that Richard Arthur Tremper Jr. reported for duty at the home of Mr. and Mrs. Tremper on June 7th. Other new arrivals in the division are a daughter at the home of Mr. and Mrs. Oliphant; a son to Mr. and Mrs. Lambly; and a daughter to Mr. and Mrs. Hilton.

J. H. Orr reports landing a 26-inch steelhead trout in Rogue River. Who's next?

Mrs. L. A. Ralston and daughters journeyed to Southern California on their vacation.

F. Heard returned recently from a vacation trip to the Yosemite.

Carl Hague and family enjoyed a motor trip to Crater Lake during the early part of the month.

Headquarters News.

Miss Elizabeth Etzel enjoyed a vacation trip to Yellowstone National Park during early July.

Mrs. Alice Nathan made San Diego the destination for her vacation trip.

Other headquarters folks who have been away on vacations are Miss Hazel McBeath, Mrs. Pearl Moynham, Mrs. Beulah Farley, Mrs. Julia Harlow, and Geo. T. Gunston.

Miss Helen Nason, stenographer in the headquarters maintenance department, is now Mrs. Horton H. Halsted following a ceremony performed in Sacramento June 14th.

Engineers Assigned.

Division III reports that A. C. Irish has been named assistant resident engineer on the Colfax-Gold Run grading contract and that W. G. Remington has been assigned to a similar position on the work underway at the Truckee Summit.

Picnic in Division V.

Staff employees of Division V with their families enjoyed a barbecue steak dinner at a picnic ground near San Luis Obispo on June 17th. The dinner was followed by an evening of merriment around a large bonfire.

W. E. Barney, Division V draftsman, tried the High Sierra for a vacation and returned home declaring old San Luis climate the best in the state.

News From the San Joaquin.

P. L. Wilcox has been transferred from Lost Hills to Coarse Gold in charge of the Madera-Yosemite survey, reports Division VI.

C. M. Rosenberg has been named resident engineer for the prison road camp grading work in Kern River canyon.

W. J. Nelson, instrument man on Kern River location work, has been transferred to the Los Angeles division.

Eugene Garrigan has been transferred to Division X at Sacramento.

Elliott Completes His Work.

Judge J. C. Elliott, right of way man for the highway commission on the Oxnard-San Juan Capistrano highway for the past two years, has completed his work and returned to Oxnard to resume his office of Justice of the Peace. (Highway employees arrested in the vicinity of Oxnard are likely to see a familiar face in a strange place.)

J. O. Marsh, office engineer in Division VII, has been reelected director of the Los Angeles chapter of the American Association of Engineers. J. C. More, assistant division engineer, has been appointed treasurer.

B. H. Burrell, of the bridge department, is now resident engineer on the Rincon seawall job.

Enjoy Outing.

Division VIII, the "Division of Desert Highways," recently enjoyed a grilled steak dinner at the San Bernardino city playgrounds on the Crest Route. Division Engineer E. Q. Sullivan challenged all comers at horse shoes.

Howard Noble, chief of party of Division VIII, was transferred recently from the Imperial Valley to Waterman Canyon in the San Bernardino Mountains. The change in temperature was from 119 to 80 degrees in the same day.

Miss Della Bittke, Division VIII clerk, visited her former home in Chicago while on a vacation.

Orin B. Fields, draftsman, took unto himself a wife in Los Angeles on June 18th. After a honeymoon in the Big Bear country, he returned to work with the usual peace offering of cigars and candy.

Continued on Page Fifteen.

SMILEWAYS

EPIC DEDICATED TO COMMISSIONER LOUIS EVERDING

ROCK ETERNAL.

Many, full many, years ago
When the cave man held full sway,
He used to slug his wife with *rocks*
To pass the time away.

Then several æons sped them by
Till the Pharoahs came on deck,
And they heaped a pile of *rocks* on high,
The pyramids, by heck!

Still later in the scale of time,
Before hash shops were known,
The Greeks, being given more to art,
With *rocks* built Pantheon.

A few more years went by, and then,
With no more Huns to goad,
Bold Caesar quoth "the times are slow,"
So he built with *rocks* a road.

Then the fathers of those who baked the beans,
Put all their goods in hock,
And they sailed across the bounding main
To land on Plymouth Rock.

And about this time Mr. Murphy said
To his good friend Malone,
"Tis a quiet old world we have, withal,"
So they kissed the Blarney stone.

And so the *rock* game carried on
Until, in modern times,
The millionaire heaps up his *rocks,*
And scorns to count the dimes.

And only four short years gone by,
Oh! why do we not die,
We used to put our foot on rails
And sip sweet *rock* and rye.

To the divisions now, Chief Morton says,
"Go forth and get some *rock*";
We do, and Pope he comes along,
Says he, "That's mud, not *rock.*"

And now the very candy looks like *rock,*
'Tis sad for me to tell,
We'll blame it on the bloomin' Frogs
And—Louis from Korbel.

So, from the silent *rocks* I learn
That some things may be done
If those who do them mix with work
A little bit of fun.

—*H. S. Comly.*

Many a driver has failed to realize that a car moving along the highway at forty miles an hour is a big responsibility.—St. Paul *Pioneer Press.*

The advisability of passing a car at a curve depends upon whether the widow will think the loss covered by insurance.—Fairmont (Minn.) *Independent.*

It is never too early in the season for motorists to remember that even on a single track railroad trains come from both ways.—Bemidji (Minn.) *Pioneer.*

Automobiles have succeeded in putting most of the horses out of business, but the jackass crop is still going strong.

Hordes of autos now remind us,
We must mend our road today;
And departing leave behind us
Paths that are not worn away.

When our children pay the mortgage
Father made to carry the load,
They'll not have to ask the question
Here's the bond, but where's the road?

Tennessee Highways.

I stood on the bridge at midnight,
A beaver was damming the river,
And a guy with a broken radius rod
Was doing the same to his flivver.

"Some Digging Animal."

R. S. Badger, of the headquarters maintenance department, was once resident engineer on a grading contract. It was his custom to dig holes in the subgrade to see that the water penetrated to the bottom of all fills.

One day the contractor visited the work, in not the best of humor, and the following conversation took place with his foreman:

Contractor: "Where's Gopher?"
Foreman: "Who do you mean by Gopher?"
Contractor: (impatiently) "Gopher, mole, squirrel, woodchuck—"
Foreman: "Oh! you mean Badger."
Contractor: (with much relief) "Yes. I knew it was some kind of a damned digging animal."

From the Accounting Department.

Mr. Cropsey: (on receipt of a letter from a vendor) "I believe some stenographer must be handling this correspondence."
Mr. Pearce: "I think so myself. It is surely someone without brains."

A Dutch judge upon trying a speed maniac for injuring a pedestrian: "Owing to de extreme gravity of dis case, I vill take it under adwisement but will ewentually give a verdict to de plaintiff."

HIGHWAY NEWS NOTES

Continued from page 14.

Clifford J. Temby, formerly with headquarters and now with Division X, is the proud daddy of Jack Temby, Jr., who arrived on June 23rd.

W. W. West, formerly with Divisions III and IV, is now a draftsman with Division X.

R. E. Pierce, Division X maintenance engineer, recently enjoyed a vacation with his family at Bijou, Lake Tahoe.

Other members of the Division X staff who have been on vacations recently are: L. E. McDougal, office engineer; Mrs. Daisy M. Nugent, stenographer, and T. Hilmar Nervig, clerk.

F. C. Hewett is now resident engineer on the Rockville-Fairfield shoulder and widening job.

Wedding in Division IV

H. G. Hughes, draftsman, was married during June to Miss Ann Louise Simonsen. They enjoyed a honeymoon in Yosemite Valley and will make their home in San Francisco.

W. W. West, draftsman, has been transferred to Division X at Sacramento.

The fact is that the only perfect rule of safety is to have safe drivers of automobiles.—St. Cloud (Minn.) *Journal-Press.*

Map showing progress of paving and other improvements on the California state highway system, and also boundary lines of the various divisions.

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CALIFORNIA HIGHWAYS

OFFICIAL PUBLICATION OF THE CALIFORNIA HIGHWAY COMMISSION

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WHERE ARE WE DRIFTING IN HIGHWAY CONSTRUCTION?

In this issue of the HIGHWAY BULLETIN *Mr. Morton* takes stock of the situation in answer to this question — The information presented by the State Highway Engineer is necessary to a proper understanding of the problem now confronting California.

THAT FEDERAL AID BALANCE

Do you know what it is and how it is determined? — What part does it play in the *financing of California highway construction*? — An answer to these questions will be found in the article on page seven of this number.

STATE WINS IMPORTANT LAWSUITS

On Page Ten

California Highway Department

California Highway Commission

HARVEY M. TOY, Chairman, San Francisco

N. T. EDWARDS, Commissioner, Orange — LOUIS EVERDING, Commissioner, Arcata

R. M. MORTON, State Highway Engineer, Sacramento

PAUL F. FRATESSA, Attorney, San Francisco — W. F. MIXON, Secretary, Woodland

---

Headquarters Staff, Sacramento

T. E. STANTON, Assistant State Highway Engineer

FRED J. GRUMM, Office Engineer in Charge of Surveys and Plans

C. S. POPE, Construction Engineer

HARLAN D. MILLER, Acting Bridge Engineer

R. H. STALNAKER, Equipment Engineer

G. R. WINSLOW, Maintenance Engineer

LOWELL R. SMITH, Purchasing Agent

HERMAN B. WEAVER, Chief Accountant

Division Engineers and Headquarters

T. A. BEDFORD, Division I, Willits

H. S. COMLY, Division II, Dunsmuir

F. W. HASELWOOD (Acting), Division III, Sacramento

J. H. SKEGGS, Division IV, San Francisco

L. H. GIBSON, Division V, San Luis Obispo

J. B. WOODSON, Division VI, Fresno

S. V. CORTELYOU, Division VII, Los Angeles

E. Q. SULLIVAN (Acting), Division VIII, San Bernardino

F. G. SOMNER, Division IX, Bishop

J. C. McLEOD, Division X, Sacramento

General Headquarters, Fifth Floor, Forum Building, Sacramento

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AUGUST 1924

California Highways

VOL. 1 No. 8

WHERE ARE WE DRIFTING IN HIGHWAY CONSTRUCTION?

STATE'S CHIEF ENGINEER TAKES STOCK OF SITUATION

By R. M. MORTON, State Highway Engineer.

THE building of the state highway system in California had its inception in 1910 when the first highway act was approved by the people. This issue was for $18,000,000, and under the terms of the law enacted at that time, a state highway commission of three members and the office of state highway engineer were created. The commission had within its jurisdiction the specific location of the general routes described in the bond measure, which provided for a main north and south road through the coast counties, and other roads necessary to connect county seats with these main lines.

R. M. MORTON

This general plan remains the nucleus of the California state highway system; but in 1924, fourteen years later, eight county seats are still unconnected with the main trunk lines.

The First Bond Issue.

The mileage of state highway acquired under the terms of the first act was 3064. Of this total, to April 1st of this year, 1746 miles have been paved by the state, 715 miles have been graded or graveled by the state, or with forest service cooperation; 178 miles, paved by the counties, have been taken over by the state; 34 miles built by the counties have not yet been taken over, *and 391 miles remain in the same condition as in 1910—with no state expenditure.*

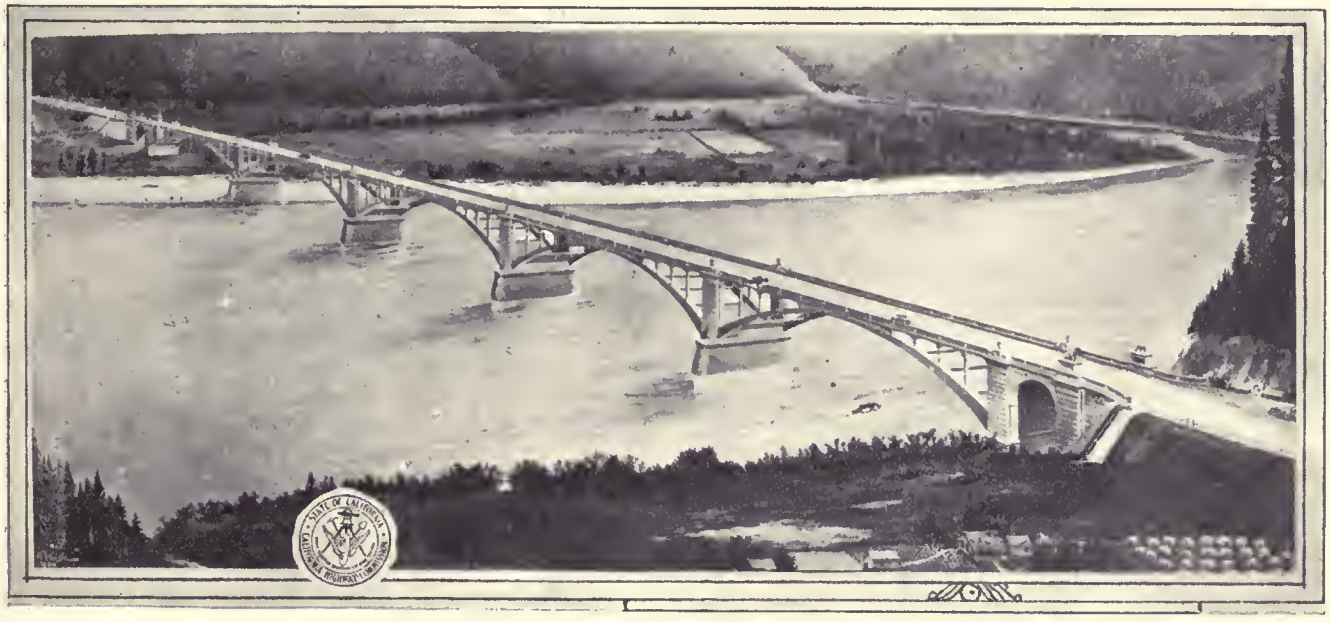
The construction accomplished was not defrayed entirely from proceeds of the first bond issue. In 1915, with the first finances practically expended, a second bond issue of $15,000,000 was voted. Of this sum, $3,000,000 was to be matched by an equal amount by certain counties, through which additional roads were located and, by the second bond act, added to the state highway system. These additional laterals aggregate 701½ miles.

Owing to the war inflation of construction costs, and the necessity of raising money for the support of our armies, no contributions were made by the counties toward the construction of the additional 700 miles. This feature of the law was finally repealed by the third bond act, with the result that the $15,000,000 was expended almost entirely toward the completion of the older roads.

Second Bond Roads.

Of the 701 miles of second bond issue roads, 454 miles have been graded, graveled or paved by the state; 45 miles of paved road have been taken over from the counties and are now under state jurisdiction; 24 miles have been paved by

(Continued on next page.)



KLAMATH MEMORIAL BRIDGE—The above is a conception of the Dr. G. H. Douglas Memorial Bridge over the Klamath River near Requa, Del Norte County, now under construction. The drawing was prepared for the bridge department by E. M. Muse. The bridge will be the largest on the California state highway system.

PROTECTING THE HIGHWAY FROM OCEAN WAVES, DIVISION VII.—Upper left, trucks equipped at the Lankershim shops with stiff leg boom, chain block and stone hooks for rapid handling of rock. Upper right, incline chute hinged to side of truck and supported by posts for unloading rock over embankments. Lower left, view showing bank wash caused by waves along the Santa Monica coast; and, lower right, rip rap in place on the beach.

PROTECTING THE HIGHWAY FROM OCEAN WAVES

TO prevent further encroachment by the waves, over 2,000 tons of heavy granite rip rap rock, two to five man size, have been placed by maintenance crews of Division VII at the foot of embankment slopes, along the Coast boulevard north of Santa Monica. (L. A. 60 B.)

The rip rap was made necessary by wave action during high tides and wind storms of recent months. The waves were washing away the embankment slopes in numerous places, making protection of the pavement imperative.

Trucks used for hauling the heavy rock were equipped at the division shops at Lankershim with a stiff leg boom, provided with chain block and stone hooks, which greatly facilitated the work. An incline chute, hinged to the side of the truck and supported by posts when in use, was employed where necessary to chute the rock over high embankments.

Rock was unloaded from flat cars, hauled an average of three and a half miles, and placed in approximately its final position at a cost of 94 cents per ton.

MORTON TAKES STOCK

(Continued from page 3.)

the counties, but are not taken over; *and 177 miles remain to be built.*

In 1919, the people, informed by state officials that still more money was required to complete the highway system, authorized, by constitutional amendment, a third bond issue of $40,000,000. With this fund it was planned to complete all of the previously designated state highways, and also to construct certain additional roads, by the 1919 act transferred from the counties to the state highway system.

Third Bond Situation.

It was realized at that time that a large amount of money was necessary to complete the work already started. Unfortunately, however, for the roads of the first and second bond issues, it was considered necessary, in order to popularize the measure, to include numerous additional roads, aggregating 1848 miles.

To April 1st of this year, there had been graded, graveled or paved by the state highway commission a total of 403 miles of these additional roads; 29 miles paved by the counties had been taken over by the state; 24 miles paved by the counties had not been taken over; *and 1392 miles are yet to be constructed.*

Bond Road Summary.

Summarizing the situation relative to all the state's bond issue roads: the total mileage is 5614, of which 2085 miles have been paved by the state; 252 miles have been paved by the counties and taken over by the state; 83 miles paved by the counties are still under county jurisdiction; 1233 miles have been graded and graveled by the state; and roads on which no work has been done total 1961 miles.

Since 1910, and in fact prior to that time, the legislature at various sessions has designated certain roads as state highways. Sometimes appropriations have been made for construction or repair work, but more frequently the roads have been designated state highways without funds for construction purposes. The total length of these special act routes is now 1009 miles, for the greater part of which no funds have been provided. The upkeep of practically the entire distance is, however, a charge against the state's maintenance funds.

Of these legislative act roads, 37 miles have been graded, graveled or paved; 29 miles, paved by the counties, have been taken over by the state; and 943 miles have had no expenditure except from limited maintenance funds.

40 Per Cent Unconstructed.

THESE FIGURES MAKE A TOTAL OF 6623 MILES OF STATE HIGHWAY, OF WHICH 143 MILES HAVE BEEN DESIGNATED BOTH IN BOND ISSUES AND LEGISLATIVE ACTS. THE NET MILEAGE OF STATE HIGHWAYS, THEREFORE, IS NOW 6504 MILES. OF THIS TOTAL, THE STATE HAS PAVED 2085 MILES; COUNTIES HAVE PAVED AND THE STATE HAS ADOPTED 280 MILES; COUNTIES HAVE PAVED AND THE STATE HAS NOT ADOPTED 83 MILES; THE STATE HAS GRADED 1240 MILES; LEAVING 2814 MILES ON WHICH NO CONSTRUCTION WORK HAS BEEN DONE.

These unconstructed state highways constitute about 40 per cent of the present total state highway mileage of California.

A study of the location of the unconstructed roads shows that the state has made good progress toward the completion of the originally specified north and south routes through the valleys and along the coast. Many important sections, however, have not been finished.

Interstate Connections Unimproved.

In the country north of Eureka only two grading and graveling contracts have been undertaken.

Only in March of this year, was the original grading completed on the last unit between Dunsmuir and Yreka, on the Pacific highway, a route on which construction was authorized in 1910. At the beginning of this year, 117 miles remained unpaved between Redding and the Oregon line, although through Oregon and Washington the main north and south highway is paved from the California line to Vancouver.

Additional locations to which little attention has been paid are on other interstate connections, such as the line from Colfax to Verdi, the important connection from the east for northern and central California. The Needles-Barstow highway, one of the heaviest traveled interstate roads, is only a wheel rut across a sandy desert for 200 miles. On the road from El Centro to Yuma, an expenditure of hundreds of thousands of dollars will be required to make a creditable interstate connection. The interstate travel in the south is heavy and is served by a third state highway route located in Riverside County, extending from the Colorado River at Blythe to Mecca and San Bernardino. No work has been done on this road—100 miles across the desert.

The state highway system also includes many roads largely of recreational value. Little has been done thus far to develop highway service to Yosemite Valley, to Lake Tahoe, and many other vacation areas reached by the projected state highway system.

Reconstruction Big Problem.

In addition to the problem of completing the roads which have been state highways for many years without construction money being expended, the state already has reached a point where it must consider the rebuilding of many roads where traffic has increased far beyond expectations of previous years.

The enactment of the gasoline tax measure at the last session of the legislature as a means of providing revenue, was an attempt to solve the reconstruction problem. During the year 1924, the first year in which the state's share of the tax has been available, the highway commission will expend $4,500,000 on reconstruction work. The constructed state highway system, in many places, is already far behind traffic requirements. The highway commission could easily expend, if available, $10,000,000 annually for several years to catch up with the demands of existing traffic for wider and heavier pavements.

This feature of the work, however, is only one of the immediate problems facing the people of California. The gasoline tax revenues will increase as the traffic increases and by continuous effort over a period of years, the most serious conditions will be gradually corrected.

The other vital problem facing the state is that of providing revenues for new work so that primary construction may proceed. If funds are not provided, state highway construction will be at an end in the very near future.

California has seen the highway commission face alternately periods of scarcity of funds and times when more money was available than could be expended quickly enough to satisfy the people. This has proved a decidedly uneconomical way to forward road construction. Efficient employes can not be retained when the highway organization is expanded for short periods and then reduced. Any new plan of financing should provide the organization with sufficient funds to lay out each year's program well in advance. When this is possible, details can be planned so that the work will go forward with economy and dispatch.

Expenditures From First, Second and Third State Highway Bond Funds.

The record of annual expenditures from bond funds is interesting and shows the fluxation of highway activities:

Year	First state highway fund	Second state highway fund	Third state highway fund	Total
1912	$594,110 58			$594,110 58
1913	2,098,745 61			2,098,745 61
1914	4,555,224 73			4,555,224 73
1915	7,846,255 05			7,846,255 05
1916	3,084,412 81			3,084,412 81
1917	223,985 20	$1,769,501 96		1,993,487 16
1918	109,056 49	5,854,446 78		5,963,503 27
1919		5,564,523 63		5,564,523 63
1920		524,092 78	$6,716,033 32	7,240,126 10
1921		774,217 18	10,048,126 92	10,822,344 10
1922		1,143,611 24	12,685,253 42	13,828,864 66
1923		299,908 58	11,539,430 54	11,839,339 12
1924 (to May 31st)		799,217 91	2,933,949 53	3,733,167 44
Total to May 31, 1924	$18,511,790 47	$16,729,520 06	$43,922,793 73	$79,164,104 26

NOTE.—Amounts include federal aid paid into the three funds, county contributions, and bond premiums.

This statement is remarkable in that it shows capital expenditures for the years 1921, 1922 and 1923 averaging

$12,000,000 per year. These expenditures do not include receipts from the motor vehicles or gasoline tax revenues, which, in 1924, will be about $8,000,000.

Highway construction should proceed only at the rate desired by the people. However, if the state is to meet the insistent and universal demand that the highway system be completed as soon as possible, at least $12,000,000 per year will be required for new construction. And if, in mileage of new construction, the state is to progress faster in the future than it has during the past four years, this expenditure of $1,000,000 per month will be too little.

Cost to Complete System.

Even an expenditure of $12,000,000 annually on original construction is small when compared with the total estimated cost of completing the highway system as at present designated, which, early in 1923, was placed at $200,000,000 by the department in response to an inquiry from the legislature. The period required to expend such a sum on the highways would witness increases in traffic and other developments that would require increasingly higher standards of construction. The total of $200,000,000, therefore, should be considered the minimum when computing the cost of completing the state highways of California.

At the present time the engineering forces, at the request of the Committee of Nine, are making a more careful estimate of the cost of completing the system. This information will be available sometime this fall.

Higher Standards Increase Costs.

In considering the completion of the system, it should be borne in mind that we have been compelled to raise standards of construction. This has increased initial expenditures per mile above average costs of past years. Highways must be built which will anticipate traffic requirements, at least for a few years, in order not to immediately add to the reconstruction program—a burden already heavy on the previously built highways.

Future costs also will increase because many of the remaining unconstructed units are located in the remoter and mountainous sections of the state where the cost of grading and surfacing is far above the average for similar work in the valleys, where much of the highway building has been done in the past.

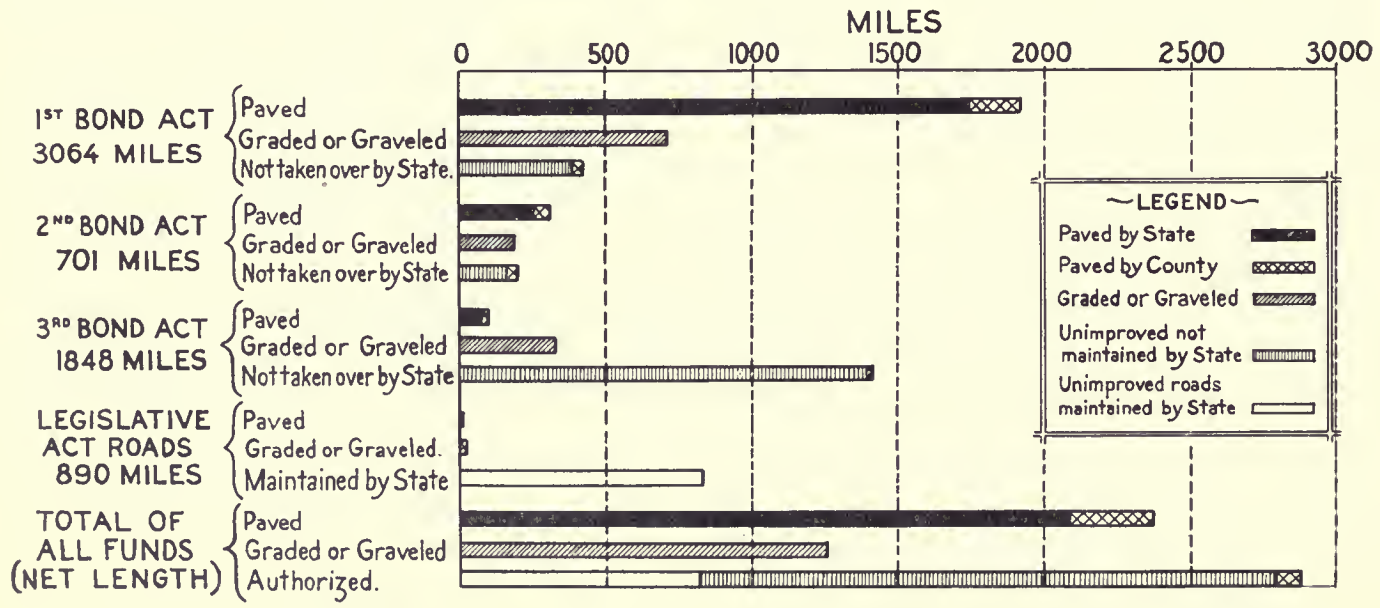
The total of all expenditures passing through the books of the highway commission during the fiscal year 1922–23 was $18,000,000. The total during the year 1923 was $16,000,000. An expenditure of $20,000,000 annually would require practically no change in the highway organization.

Those who come in contact with the insistent demands from all parts of the state for highway construction are well aware that $20,000,000 annually will not meet the desire of the people for immediate extension of the improved highway system. Proper maintenance, necessary reconstruction to save investments in old pavements, and only a limited program of new construction on the present state highway system, will require all of $20,000,000 a year.

Twenty Millions a Year Minimum.

It is the conviction of the writer that this sum is the minimum annual expenditure for state highway maintenance and construction which should be considered when the people of California, through the legislature, take up the solution of the highway financing problem.

CALIFORNIA HIGHWAY SITUATION AT A GLANCE



The above is a graphic summary of Mr. Morton's article. Particular attention is called to the consolidated summary at the bottom which clearly shows the comparative lengths of improved and unimproved state highways as they exist at the present time.

CALIFORNIA'S FEDERAL AID BALANCE

There is no more misunderstood highway term than "federal aid." In the minds of many it is a mysterious something that keeps highway work going. This article briefly explains how the state's share is determined, how much California has coming, and the part it plays in highway construction.—THE EDITOR.

THE agricultural appropriation bill signed by the President on June 5th, last, under which the Secretary of Agriculture on June 6th apportioned the $75,000,000 authorized by the act of June 19, 1922, for the fiscal year 1925—July 1, 1924 to June 30, 1925—added $2,464,990.78 to the amount of federal aid legally available for California.

This sum brings the total of federal aid apportioned to California, from 1916, the date of the inception of the cooperative system, to 1924, to $17,093,306. Of this amount, $14,335,716.95 had been obligated or was in process of obligation by the state highway commission on July 1, 1924—that is, cooperative agreements between the state and the Secretary of Agriculture to this total have been signed or agreed upon.

The unobligated balance apportioned to California on July 1st was $2,757,589.05. Under the law, the state has until June 30, 1927, in which to take up the greater part of this balance on new projects.

Federal Aid Uncollected.

Of the $14,335,716.95 in federal aid already obligated by California, $9,461,376.47 had been collected up to the beginning of the present fiscal year, and deposited in the bond funds, *leaving an uncollected balance on July 1st of $7,631,929.53. This latter sum may be termed the working fund of the California Highway Commission for primary construction.*

Federal aid comes to the state only in the form of reimbursements from the national government for its share of the cost of approved projects on the federal aid system. Thus, the $7,631,929.53 still due California will be paid as it is "earned" by expenditures on contracts now under way and expenditures on contracts to be awarded in the future.

The rate at which this comes in will determine the construction program in the immediate future. Recent payments average about $240,000 per month.

The recent act of congress and the apportionment order of the Secretary of Agriculture obviate any interruption to federal aid road work. The apportionment is made to the states on the same basis as for preceding years, except that Hawaii, for the first time, is admitted to a share.

How State's Share is Determined.

The method of determining each state's share of the federal aid appropriations as contained in the federal aid act is as follows:

One-third in the ratio of the area of the state to the total area of all the states;

One-third in the ratio of the population of the state to the population of the entire country as determined by the latest available federal census;

One-third in the ratio that the mileage of rural delivery and star mail routes of the state bear to the total mileage of rural delivery and star mail routes in all the states.

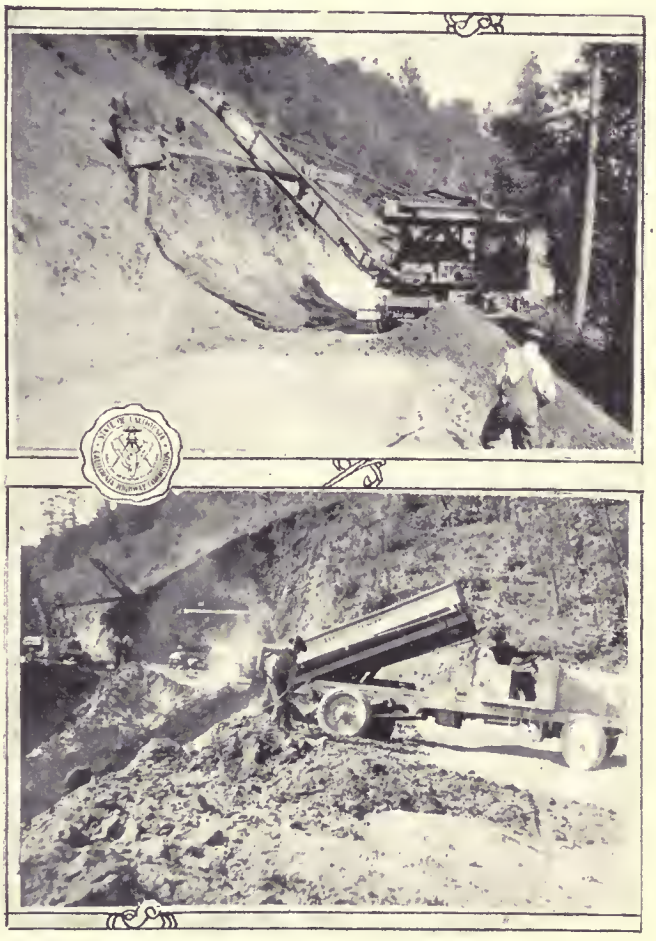
It is also provided that no state shall receive less than one-half of one per cent of each year's appropriation.

Except in the public land states, the law limits the federal government's participation to not more than 50 per cent of the cost of any given project and not to exceed $15,000 per mile. The provision, applying to the ten public land states of the West, where large areas of land are in the ownership of the federal government, enables them to secure an additional percentage of the cost of federal aid projects in the proportion as the public land is to the total area of the state, but not additional funds.

California is one of the public land states and gets 59 per cent federal aid on approved projects, but not to exceed $17,795.90 per mile. The state's total apportionment is not increased.

In other words, on a project costing $30,000 a mile, the California Highway Commission can collect from the government 59 per cent of the cost, but no matter how much the project may cost in excess of $30,000 a mile, the federal aid allotment will be only $17,795.90 for each mile. Bearing in mind this limitation and the heavy cost of much of the primary construction now under way in California, the slowness with which federal aid accrues to the state will be readily understood.

(Continued on next page.)



MAKING THE REDWOOD HIGHWAY SAFE—Steam shovel and truck outfit busy in Division I widening the Redwood Highway, Mendocino County, a federal aid route.

CALIFORNIA'S FEDERAL AID BALANCE EXPLAINED

(Continued from page 7.)

Repeal of Limitation Pending.

Bills are pending in congress to repeal the $15,000 per mile limitation and permit the states to collect one-half of the cost of approved projects regardless of the amount. Legislation also is pending which would permit the federal government to advance the entire cost of construction on certain federal aid highways through the more sparsely settled public land states.

Enactment of these measures would be of inestimable benefit to such states as Arizona and Nevada and will hasten the day when there will be connected and improved highways from the east to the west.

Federal aid allotted to California by the recent apportionment of the Secretary of Agriculture represents about 3½ per cent of the total appropriation for the entire country. California's $2,464,990 is exceeded by the allotments made to Illinois, New York, Ohio, Pennsylvania, and Texas, which latter state gets the largest apportionment of all—$4,410,169.

Since 1916, a total of $540,000,000 has been made available by previous acts of congress. The Bureau of Public Roads of the United States Department of Agriculture which administers these funds, reports the status on May 31st as follows: Completed 32,099 miles, under construction 17,000 miles, approved for construction 2518 miles, and $33,106,126 available for new projects. A continuation of the policy is to be expected.

In California, a total of 128 projects have been approved for federal aid since 1916, when the federal government first began to assist in the building of highways. These projects involve construction of a number of bridges and more than 1000 miles of state highway.

Small Part of California Income.

From 1917 to June, 1924, the California Highway Commission expended $60,985,355 from the first, second and third bond funds, including $9,461,376 federal aid collected during this period, as previously stated in this article, and deposited in the bond funds. The federal aid, therefore, represents approximately 15.5 per cent of California's income for primary construction and not one-half of the total expended as many presume.

For the country as a whole federal aid represents, according to reports, an average of 19.6 per cent of the income of the various state highway departments.

In the above statement of expenditures in California, no account was taken of funds disbursed for maintenance and reconstruction of state highways, which amounted to $18,931,932 in the period between 1917 and June, 1924. Some of the gasoline tax money now being expended on reconstruction of the state highways is "earning" federal aid in the same way that expenditure of bond funds has in the past.

The Federal Aid System.

From 1916 to 1921 federal aid, with the approval of the Bureau of Public Roads, was granted on any post road of the state. Since the passage of the amended act in 1921, federal aid has been restricted to a definite system of highways, designated the "7 per cent system." This federal aid system comprises 7 per cent of the total road mileage of the state outside of incorporated cities, and is divided three-sevenths interstate and main trunk lines and four-sevenths intercounty laterals.

The California federal aid system was agreed upon in 1922 by the State Highway Commission and the Bureau of Public Roads. The routes selected aggregate approximately 4467.6 miles. This total may be increased in the future by approval of supplemental routes to a maximum of 4900 miles—the full federal aid mileage allowable based on 7 per cent of the total highway mileage of the state at the time of the passage of the Federal Highway Act in 1921.

California 7 Per Cent System.

The following routes, practically all state highways, comprise the 7 per cent federal aid system in California:

Primary Roads.

Route	Description	Length, miles
1	Oregon line to San Francisco	410.0
2	San Francisco to San Diego	499.0
3–7–6	Oregon line to Sacramento	295.6
4	Sacramento to Los Angeles	357.4
12–27	San Diego to Yuma	170.6
14–7–3 17–37	San Francisco to Verdi	198.0
5	San Jose to French Camp	84.3
	Total mileage primary roads	2,014.9

Secondary Roads.

9–26	Los Angeles to El Centro via San Bernardino	203.2
31–58	San Bernardino to Needles via Barstow	240.0
	Needles to Arizona line at Mellen	16.0
	Route 58 near Goffs to Nevada line	25.0
63	Big Pine to Oasis	38.6
	Oasis to Nevada line	4.4
29	Red Bluff to Susanville	107.5
21	Richvale Junction to Quincy	93.4
3	Roseville to Red Bluff	116.9
23	Saugus to Bridgeport	330.1
55	Skyline Boulevard	62.1
5	San Jose to Santa Cruz	33.1
32	Gilroy to Califa	83.5
18	Merced to Yosemite National Park via El Portal	70.5
15–17	Ukiah to Cisco	165.0
28	Redding to Alturas	157.7
	Alturas to Oregon line	35.0
20	Redding to Route 1 via Weaverville	161.6
45	Willows to 3 miles north of Biggs	32.2
11	Sacramento to Nevada line via Placerville	107.9
10	San Lucas to Sequoia National Park via Visalia	149.0
57	Santa Maria to Freeman via Bakersfield and Walker's Pass	200.0
1	Crescent City to Oregon line (via Coast)	20.0
	Total mileage secondary roads	2,452.7

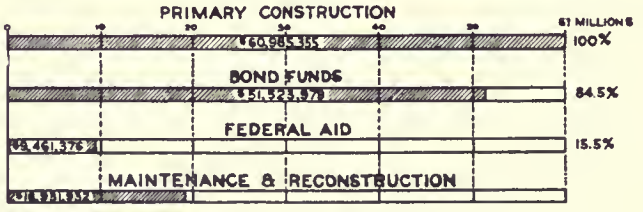
Summary.

Total length primary roads	2,014.9
Total length secondary roads	2,452.7
Total length of system	4,467.6

(See map of federal aid system on back cover.)

GRAPH OF EXPENDITURES ON STATE HIGHWAYS

1917 TO 1924



The above graph shows federal aid to be a small part of the capital expenditures of the commission, as explained in the above article, and less than the maintenance and reconstruction fund.

"The character and civilization of any community can be properly judged by the class of roads it has."—*Gibbon.*

"California's highways are all that roads should be. California always is worth seeing and good roads make the time spent doubly worth while."—*General H. W. Grimwade, Melbourne, Australia.*

STEAM SHOVEL OPERATIONS ON THE STATE HIGHWAYS—Upper views show activities on the Hauser contract, along the Ventura coast, Division VII. The two lower views were taken in the Truckee River canyon and show the actual beginning of the first contract on this section of the state highway between Truckee and Boca, Division III.

ELIMINATION OF GRADE CROSSINGS GRAVE PROBLEM

By J. B. Woodson, Division Engineer, Fresno.

ACCORDING to published records, 2268 persons were killed and 6314 injured at grade crossings in the United States during the year 1923, and in the past five years 9101 have been killed and 24,208 injured. The average person does not give much thought to statistics. If, by chance, he happens to note a placard setting forth the appalling facts, he merely classifies it with other nonimportant notices.

But the above figures are significant. Any of us may be next. And, despite the fact that it is incumbent upon every driver to be positive that there is no train wanting to use the crossing at the same time he does, obviously, there is but one solution for this nationwide menace, and that is, separation of grades.

Must Use Brain.

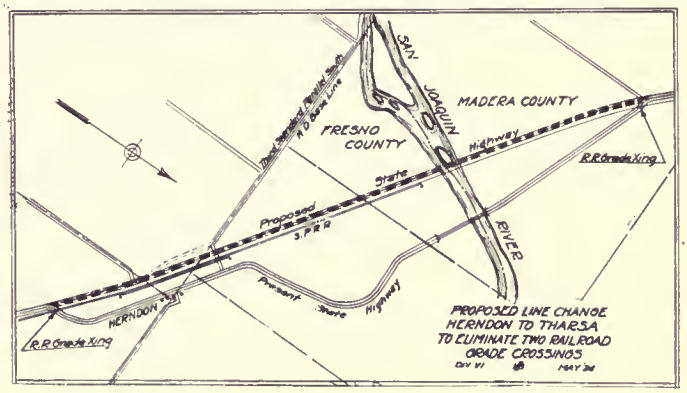
Stages, school busses, and trucks are now compelled by law to stop upon approaching railroad crossings. Drivers of these vehicles, however, go on from month to month, perfunctorily stopping and starting without accident, until the duty becomes so mechanical that drivers come to consider the stopping their primary duty, while, as a matter of fact, the purpose is to ascertain whether or not a train is approaching.

It is no uncommon thing to note the driver of a motor bus or truck come to his prescribed stop, and then start across the track without looking in either direction. Signal bells, signs, warnings—all are of no avail unless the brain is used.

The obstacle in the way of grade separations is the cost.

There are two types of grade separations: the overhead crossing and the subway. Except where natural physical conditions warrant, for example, depressed railroad tracks or tracks through a cut, construction of subways is preferable. In level country, especially in built-up areas, an overhead crossing is unsightly, obscures the light, and detracts from the value of surrounding property. A long, high trestle is not comparable with a concrete subway built on easy grades and adequate curves. Divergencies from the common grade elevation are also much more favorable for construction of subways than overhead crossings; the former being 14 feet (California Railroad Commission Rules) below structure girders, whereas with the overhead crossing 22 feet above the rails is required.

In the opinion of the writer, the California Highway Commission has no more important problem than the elimination of these death traps.



Proposed elimination in the San Joaquin Valley.

STATE WINS IMPORTANT LAWSUITS

By Paul F. Fratessa, Attorney, California Highway Commission.

TWO lawsuits have recently been decided in favor of the California Highway Commission which are of considerable importance.

The first is the suit brought by Palmer & McBryde against the state for extra compensation claimed by them on a contract in Del Norte County. The road was built along the side of a cliff, overlooking the ocean. The contractors put in some heavy blasts and caused large quantities of material to slide into the sea. The bank broke back beyond the original slop-stakes and the contractors sued for this additional material. The defense was that the over-break was due to over-shooting.

Paul F. Fratessa

The contractors sought a writ of mandate to compel the State Highway Engineer to amend his final estimate to include this extra material. The case was decided chiefly upon the ground that the proceedings in mandamus were not the proper remedy and that the contractors should have begun a straight suit on their contract.

Important in Future.

The court pointed out that the engineer is the agent of the state for the examining of the work and the estimating of the amount payable, which necessarily requires the exercise of judgment. The examination having been made, the court is without power to direct the engineer to make a different finding.

There was another point in the case which is instructive in future transactions. The court held that the check given in payment for the final estimate was so worded that, by its acceptance, the contractors waived all further claims. It is important that the division engineers, and others making final settlements with claimants, should have it definitely understood and clearly stated that by accepting the money the contractor waives all further claims and demands against the state under the contract or purchase order. That will save much trouble and litigation.

Injunction Asked.

The second case was brought by the California Highway Commission against a rice grower in Colusa County to enjoin him from permitting irrigation water to drain upon the highway. There is much alkali in the adobe soil beneath the pavement on portions of this road and when it becomes wet it greatly weakens the foundation of the pavement. Many rice growers in the neighborhood were using the drains on each side of the highway right of way as drainage canals and were causing the pavement to crack and crumble.

The draining of this water upon the right of way or even the permitting of it to seep upon the road is directly prohibited by Section 588 of the Penal Code, and by Section 5 of "An act providing for the care, management and protection of state highways," found on page 43 of the pamphlet of "Important Statutes Relating to the California Highway Commission."

Immediately upon the injunction being served, the grower in question stopped draining water on to the road and the commission accomplished the end desired.

The case demonstrates that persistent acts of damage to or interference with the highways can thus be effectively stopped by injunction proceedings. The commencement of this suit is evidence of the determination of the commission to protect the state highways from unlawful damage by every rightful means within its power.

Views showing unlawful drainage of irrigation water from rice fields along highway right of way in Colusa County. This was stopped when the Commission asked for an injunction.

The Oklahoma Highway Commission is considering the use of convicts in the construction of state highways.

With the completion of the construction work maintenance begins, and upon the efficiency of the system of maintenance of the roads of the state depends in a very large measure the success or failure of a state's road program.

WAGNER RESIGNS - - TO BE SACRAMENTO CITY ENGINEER

A. J. WAGNER, chief maintenance engineer, and for nine years connected with the engineering staff of the California Highway Commission, has tendered his resignation to State Highway Engineer R. M. Morton to accept a position as city engineer of Sacramento. He assumed his new duties August 1st, under an appointment by City Manager H. C. Bottorff.

A. J. WAGNER

Wagner was a chief of party in Division IV in 1912, and before and after that date was engaged in railroad work in California and Oregon.

Since 1915, he has been chief bridge designer, office engineer, chief construction engineer, field inspector, and since the reorganization of the department under Mr. Morton, maintenance engineer.

Throughout the department, regret has been expressed by Mr. Wagner's many friends because of his resignation. All join in wishing him success.

WINSLOW AND HASELWOOD ARE GIVEN PROMOTIONS

APPOINTMENT of G. R. Winslow, division engineer, Division III, to the position of assistant highway engineer in charge of maintenance to succeed A. J. Wagner, resigned, is announced by State Highway Engineer R. M. Morton. The appointment became effective August 16th. F. W. Haselwood, assistant bridge engineer, will succeed Mr. Winslow as acting division engineer in Division III.

G. R. WINSLOW

Mr. Winslow, new head of the maintenance division, has been with the department from the beginning, having entered the state's service January 1, 1912, the day of the organization of the first state highway commission. He served as headquarters office engineer, assistant highway engineer, and division engineer.

Pioneer Road Builders.

Before coming to California, Mr. Winslow was connected with initial state highway construction in Massachusetts and New York.

F. W. HASELWOOD

Mr. Haselwood also has long been in the service of the California Highway Commission. He joined the forces of Division I at Willits in February, 1912, as assistant division engineer, a position which he held continuously until last October when he was transferred to headquarters as assistant bridge engineer. For some time he has been engaged in making special studies of grade crossing elimination.

ROAD BUILDERS AT PLAY

McKINLEY PARK PICNIC—Employees of the commission from headquarters, Divisions III and X, and the headquarters shops, gathered at McKinley Park, Sacramento, on the evening of August 7th for an outdoor dinner and frolic followed by a dance in the park clubhouse. Leaders in arranging the affair were Tom Wright, Elizabeth Etzel, Charlotte Barnes, Fern Dunkeson, and Mrs. Nathan. A volunteer orchestra from the Motor Vehicle Department furnished music for the affair. Nearly 200 were in attendance.

At a recent luncheon of the Sacramento Chapter of the American Society of Civil Engineers, of which he is a member, Mr. Wagner, retiring maintenance engineer, was presented with a handsome gold watch, the gift of his many friends in the highway department. Mrs. Wagner also was remembered.

There must be a limit in weight per wheel base beyond which a motor truck will not be permitted so that a highway can be constructed with the known weight that its surface will have to sustain. This is essential.—*Highway Engineer and Contractor.*

WHAT THE DIVISIONS ARE DOING

Steam vs. Gasoline.

STEAM and gas shovels are having a hard fought battle for supremacy in work accomplished in the reconstruction and straightening of the alignment of the Redwood highway, approximately forty miles north of Willits, in Division I. In three weeks, 31,000 cubic yards were excavated by and hauled from a ¾-yard P. & H. gas shovel and a ¾-yard Erie steam shovel working double shifts. In one week's run, there was a difference of only nine swings between the two shovels.

Contractor Ahead of Schedule.

The Nevada Contracting Company is 29 per cent ahead of its schedule on the widening and straightening work on the Pacific highway between Bayha and Halfway Creek, Shasta County, in Division II. The progress chart shows 100,000 cubic yards moved. At this rate the roadway excavation will be completed by November 1st. The concrete work is even with the schedule and the surfacing should be completed before the heavy winter rains.

For eight days, recently, the Kaiser Paving Company, working north of Redding, laid 630 feet per day of twenty-foot pavement, or 252 cubic yards of concrete per day. At the present rate of progress, the ten-mile contract will be completed and the road opened for traffic by October 20th.

Polk and Polk, contractors, are at work on the asphalt macadam paving job east of Susanville, Lassen County, and are planning to rush the work to completion before the end of the warm weather. The same firm expects to complete the Chester surfacing contract by September 15th. Crushed gravel has been substituted for pit run for surfacing.

On the surfacing contract between Janesville and Milford, Lassen County, the Warren Construction Company has completed more than half of the base course. Sandy subbase and lack of water are adding to the problems of the contractors.

Division II has permanent stations under construction near Susanville, Lassen County, and Canby, Modoc County.

Dirt Flying on Auburn Route.

Five power shovels are working night and day on two contracts on the state highway between Auburn and the Nevada line, in Division III. Irey and Holden have three shovels at work between Truckee and Boca. The rough grading is more than half finished.

Between Colfax and Gold Run, C. R. Adams has two shovels on the job, operating night and day. Excellent progress is being made on the eight miles of grading.

Extensive repairs are being made to the bridge over the Sacramento River at Butte City, on the Oroville-Willows route.

A power shovel is still at work widening the road around Lake Tahoe. About $12,000 has been expended on this road to date.

Oiling is being tried on the highway east of Auburn in an effort to prevent raveling and lessen the dust.

Work is under way by state forces on widening and other improvements on the northerly end of the Mother Lode highway, just south of Auburn. In cooperation with Placer County, $10,000 will be expended.

Drainage is being improved on the Downieville lateral by installation of corrugated metal pipe culverts.

Studies are under way looking to the elimination of the historic Slippery Ford and Meyers grades on the Placerville route to Lake Tahoe.

Contracts Nearing Completion.

Barricades are rapidly disappearing in the Valley of the Moon where rapid progress is being made by Galbraith and Janes, contractors on the Schellville-Beltane paving and grading contract, Sonoma County, reports Division IV. Paving has been completed between Boyes Springs and Schellville. A considerable part of the road is open to traffic.

The asphalt output at the commission's plant at San Jose was 232 tons per day in connection with the Milpitas to Covote Creek widening and thickening job recently completed by the Federal Paving Company. This exceeded expectations of both the division and the contractor.

Motor equipment entirely is handling the grading contract of J. P. Holland on the Skyline Boulevard between Half Moon Bay and the La Honda road. Grading has been completed on the original six-mile contract and the contractor is now at work on the extension. A force of five steam shovels, seven tractors, and fifteen five-ton trucks are in operation.

Four miles of narrow road were widened to thirty feet between Boulder Creek and the State Redwood Park before lack of funds made it necessary to shut down operations which were being conducted with state forces.

Operations have been started by Freeman and Whiting, contractors, on the Redwood City-Palo Alto widening and thickening job, on the Peninsula highway.

W. A. Dontanville, contractor, is at work on the "flush" concrete shoulder job between Greenville and Livermore, Alameda County.

Foreman After Law Breakers.

Verne Simpson, maintenance foreman in the Tulare district, Division VI, has been making quite a record lately for prosecuting truck and tractor drivers who violate the law relative to use of the state highway. Simpson recently secured the conviction of a truck driver who had an insufficient amount of rubber on his solid rubber truck tires. A tractor driver also was fined, through Simpson's efforts, for driving his machine over the highway without removing the flanges.

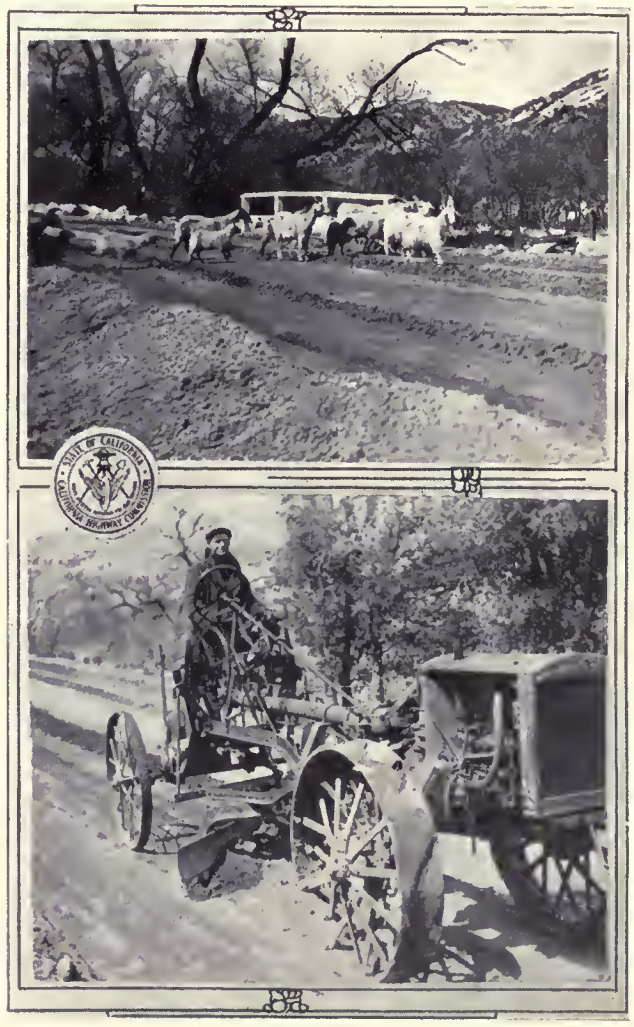
Curing Pavement With Calcium Chloride.

Calcium chloride is being used extensively for the curing of concrete pavement on the George Oswald contract between Shoup avenue and the westerly boundary of Los Angeles County, due to lack of water. Over seven miles of pavement have been completed and cured by this method.

Good progress is being made on this job and also on the San Diego to Oceanside and the Camarillo paving and grading contracts.

Construction of the 56-foot pavement on the Whittier boule-

(Continued on next page.)



IN THE SAN DIEGO HILLS—It gets Foreman Glenn Cheeseman's goat to see so many kids running loose on the highway, but in spite of it he manages to keep his section of the highway in fine shape.

DIVISION ACTIVITIES

yard is progressing rapidly. Curb work is well advanced and laying of concrete pavement has commenced.

Williams and Singletary have completed their contract for widening the grade and improving drainage on the Bakersfield route between the westerly boundary of Los Angeles County and Quail Lake.

The Los Angeles County bridge department is designing bridges for Las Flores Canyon and Malibu Creek, on the Coast boulevard north of Santa Monica. An additional allotment to continue grading in this section by state forces has been granted.

Grading is well advanced on the Huntington Beach-Corona Del Mar contract, in Orange County, and paving has been begun.

Underpass Completed.

Traffic is now using the new underpass under the Santa Fe railroad at Oro Grande, Division VIII. Highway improvements in the vicinity by state forces are about completed. H. T. Smith has been in charge.

News From East of the Sierra.

Until recently, Division IX has been almost isolated from the outside world by numerous quarantine stations against the hoof and mouth epizootic. However, the quarantine has been lifted and hundreds of motorists from the cities are flocking to the mountains, with its lakes and rivers, where they may breathe deeply and forget their daily cares.

The experiment of surfacing the highway south of Independence, Inyo County, with crushed volcanic cinders is a success, reports Division Engineer F. G. Somner, despite most unfavorable conditions. The cinders have been placed on a sand subgrade in the dry season with an unprecedented scarcity of water, but the job presents a fairly compacted surface. Since May 1, 1924, the crushing plant at Division Creek has produced over 21,000 cubic yards of surfacing material.

Fair progress is being made at Sherwin Hill, twenty miles north of Bishop, where surfacing with crushed rock is under way. A well-compacted surface has been secured without any moisture whatever. The results are a striking example of what can be accomplished by persistent dry dragging.

Between Big Pine and Independence, widening of the eight-foot concrete pavement is under way. Shoulders are to be built with volcanic cinders, compacted by watering and dragging.

At Bishop, additional land has been acquired for the extension of the maintenance yard. The division office is undergoing changes, which will provide much needed additional space.

Sacramento Paving Completed.

Laying of concrete on the Sacramento-McConnell station contract of the Kaiser Paving Company, 13.03 miles was completed July 29th, ten days ahead of schedule, and will be open for traffic about September 1st. Polk and Polk, contractors, are rushing work on bridges in connection with this improvement which is one of the largest gasoline tax jobs contracted to date. The Sacramento Chamber of Commerce is planning an opening celebration.

Work has started on the construction of "flush" concrete shoulders on four miles of the trunk line highway between Rockville and Fairfield, Solano County.

In the same county, widening of the roadbed between Vacaville and Batavia was done with new soil "borrowed" from nearby fields to cover the adobe subbase and provide a better base for the new asphalt concrete pavement which will be laid twenty feet wide.

The Valley Construction Company has assembled a plant at Tracy for the widening and paving to be done between Banta and the westerly boundary of San Joaquin County.

Surveys have been completed for the improvement of the Alpine highway east of Jackson, Amador County. C. W. Springer was in charge.

Division X reports the completion of important line and grade changes in Alpine County on the road between Silver Mountain and Markleeville, a road much used by vacationists. Work is under way on line and grade changes at Pacific summit.

Maintenance forces have been using the old oil macadam wasted at the time of the paving through Galt to build shoulders along the pavement and to connect up the state highway with the paved streets of Galt.

Construction of considerable guard rail between Clay and Jackson, on the Jackson lateral, has been completed. Guard posts are being placed in San Joaquin County, between Banta and Mossdale.

On August 1st, W. P. Hodgson, with headquarters in Davis, took over the maintenance of the highway between Batavia and Putah Creek, relieving J. H. Gates.

DIVISION III GUARD RAIL.—Above, A new type guard fence erected on the Sacramento-Placerville road; below, rustic guard rail constructed of local materials near Grass Valley on the Nevada City lateral.

NEW SPRINKLERS ASSEMBLED

THE headquarters shop is just completing the assembling of seven new 980-gallon capacity sprinkler outfits, mounted on Standard model 66-S trucks. The outfit includes a 2½" x 7" centrifugal pump, capable of filling the tanks in four to five minutes. The pump is operated by a "take off" from the transmission of the truck motor.

The outfit was designed at the shop where the various units were assembled and put together. It is the very latest in the way of a sprinkler for use in the various divisions.

Delivery of two of the sprinklers was made during July.

One of the new sprinklers ready to leave the headquarters shop at Sacramento.

CALIFORNIA HIGHWAYS

OFFICIAL PUBLICATION OF THE

CALIFORNIA HIGHWAY COMMISSION

SACRAMENTO, CALIFORNIA

HARVEY M. TOY, Chairman;
N. T. EDWARDS and LOUIS EVERDING, Commissioners.

ROBERT M. MORTON, State Highway Engineer.

W. F. MIXON, Secretary.

We are pleased to permit publication of any of the matter contained herein and this privilege is extended newspapers and periodicals without restrictions.

FRANK B. DURKEE - - - Editor
P. O. Box 1103, Sacramento, California.

Vol. I. AUGUST, 1924 No. 8

JUST AMONG OURSELVES

☆ ☆ ☆

HIGHWAY NEWS NOTES

Milliken Should Look Into This.

WHILE returning home from a dance, L. S. Gatiss, shop foreman of Division I at Willits, was sandbagged and robbed when he stopped to assist two motorists by the roadside who represented that they were stalled.

Funds of the Redwood highway baseball team, composed of employees of the commission at Cummings, were stolen when the home of Mr. and Mrs. H. H. Hubbs was ransacked by burglars. Hubbs is an employee of the highway commission, residing at Cummings.

C. F. Oliphant, draftsman, has been transferred from Dunsmuir to Division I at Eureka.

Former Mechanic Drowns.

George M. Roe, former employee of Divisions II and III and also Division V and for a time mechanical inspector for the headquarters shop, lost his life recently while bathing in the surf at Santa Monica.

Division I hopes the Committee of Nine can find the "wherewithal" to complete the Redwood highway to which the members enthusiastically pledged their support during their recent tour of the north coast counties.

Division Engineer L. H. Gibson and Assistant Division Engineer E. E. Wallace from Division V were visitors at Willits recently.

I. F. Cramer, Division I clerk, has appropriated the appellation of daddy. An eight-pound son now rules his home.

Miss Helen Condon has been transferred from the Willits office to Eureka where she will act as clerk in the equipment department.

Division II Notes.

Division Engineer H. S. Comly reports Chief Clerk E. N. Babb has traded his French Ford touring car for a sedan of the same make. Division II must be a good place to work.

H. N. Nelson has been appointed resident engineer on the bituminized macadam job east of Susanville, Lassen County.

Resident Engineer T. W. Voss has been transferred to Division VI at Bakersfield. Others who have been transferred to the same division are: Draftsmen E. M. Hilton, E. R. Weigand, and rodmen J. N. Baroni and C. R. Fitzgerald.

Tour North on Vacations.

Division Engineer T. A. Bedford with his family recently enjoyed a vacation motor trip through Oregon and Washington.

Paul F. Fratessa, of San Francisco, attorney for the commission, is another who recently enjoyed a trip as far north as Seattle.

Comly With Committee.

Division Engineer H. S. Comly accompanied the Committee of Nine on two recent trips through his division.

News From Division III.

Division Engineer George R. Winslow recently accompanied the supervisors of El Dorado County on an inspection trip between the Meyers-Tallac Junction and the Nevada line, in connection with the securing of rights of way for the highway around Lake Tahoe. He also accompanied the Committee of Nine on its trip to Reno, via the Auburn road.

H. C. Darling, now resident engineer on the Irey and Holden grading contract between Boca and Floriston, suffered a sad bereavement when his three-year-old daughter sustained fatal injuries when she fell from a hammock at Dutch Flat.

C. O. Dingle, recently resident engineer on the Stony Creek bridge in Glenn County, has been transferred to Division X, where he will act in a similar capacity on the asphalt paving job in western San Joaquin County.

W. H. Irish, chief of party, has been assigned to the Cool grading job in Placer County, as assistant resident engineer. The work is being done by state forces.

H. R. Church, assistant resident engineer, is among those who have resigned due to the reduction in forces.

San Francisco District Notes.

Miss Caroline L. Bauer, stenographer with Division IV for three years, has resigned.

R. I. Dunn, former assistant resident engineer on the Skyline boulevard, is now resident engineer for the Bureau of Public Roads on a grading contract at Glorieta, New Mexico.

Wedding in Division V.

The office force of Division V, knowing well the timid ways of Chief Clerk James T. Hays, were given the surprise of their lives recently when Hays disappeared for a few days and returned with a bride, the former Miss Dorothy Ross of Lankershim.

W. L. Judkins, resident engineer on the repairing of the Nacimiento bridge, enjoyed a vacation at Pismo Beach following the completion of the job.

Doings in the Southland.

Carl Marckhoff has been transferred from Division III to Encinitas, in Division VII, as assistant resident engineer on the Whittier boulevard paving.

Meldon L. Bauders, assistant resident engineer in Division VII, was called east recently following the death of his mother in a railroad accident.

W. J. Nelson and L. C. Potter, from Division VI, are now assistant resident engineers on the Sam Hunter contract at Camarillo.

A. W. Schmuck, assistant superintendent in Division VII, is the proud daddy of a nine-pound son.

From Division VIII.

J. G. Moran, chief of party in the Imperial Valley, declares the country down there lies flat on its back instead of standing on its hind legs as it did in Division II, from which he was transferred.

C. L. Jencks, of Division II, has been transferred to Division VIII as transitman.

Division VIII reports a delightful visit from Chairman Harvey M. Toy, who was in San Bernardino recently.

Regan Resigns.

C. F. Regan has resigned as chief clerk in Division X and has been succeeded by E. W. Zumwalt, formerly of the equipment department, as acting chief clerk.

Mrs. D. M. Nugent, stenographer, is back after a vacation in Oregon and Washington.

Doings Around Headquarters.

H. J. Peacock announces the stork left a husky young bridge engineer at his home on July 19th, just too late for last month's issue.

F. H. Cushman, assistant engineer in the drafting department, and Joseph F. Fite, chief of the filing department, recently enjoyed vacations with their families at Camp Sacramento.

E. M. MacKusick of the drafting department has resigned to accept a position with the George Pollock Company in connection with the Big Sur grading contract.

G. G. Gale of the drafting department and family enjoyed a vacation tour over the Redwood highway and through southern Oregon.

Claude Simpson reports the National Guard encampment at Del Monte the best ever.

SMILEWAYS

All Right if You Don't Lose the Key.

Down in Division IV, recently, it was necessary for the police and fire departments to join one of the division's fair alphabet pounding mermaids in a search of several hours for a lost key. She had left her clothing safely locked in a closed car while she took her morning dip, but the fog was mighty cold when she couldn't find the key. Some even declare the police prolonged the search while they studied the latest creation in bathing suits.

Verily, 'Tis So.

Son (Reading)—"Pop, what is a pedestrian?"
Pop—"A pedestrian, my son, is the raw material for an automobile accident."

The song of a modern grandmother:

Hippity hop to the bobber shop,
There to lose my tresses;
I believe in comfort and short hair,
Knocked-kneed knickers and no dresses.

A Chestnut B-r-r-r.

First Waiter—"What's the difference between a boat and a Scotchman?"
Second Waiter—"I pass. What is it?"
First Waiter—"Well—a boat tips—"

A Slam at the Old Man.

The daughter of a strict-principled old deacon had attended a dance the previous night, much against her father's wishes. When she appeared for breakfast he greeted her with the words:
"Good morning, daughter of Satan."
To which the maiden respectfully replied:
"Good morning, father."

—*The Earth Mover.*

She was as pure as snow; but—she drifted.—*Lyre.*

She'll Learn.

Phyllis—"Your husband is simply wild about you, isn't he?"
Lois—"Yes, he raves about me in his sleep, but the poor absent-minded boy nearly always calls me by the wrong name."

Autointoxication.

At a dinner-party an elderly lady of very prim and severe aspect was seated next to a young couple who were discussing the merits of their motor-cars.
"What color is your body?" the young man asked the girl.
"Oh, mine is pink. What is yours?"
"Mine," replied the young man, "is brown with wide yellow stripes."
This was too much for the old lady. Rising from the table, she exclaimed to her hostess:
"I really must be excused. When young people ask each other the color of their bodies at a dinner-party it is time I left the room."

TRANSPORTATION

I am the pioneer, the blazer of the trail;
Upon my prowess mankind shall succeed or fail.
I am the benefactor and the artisan
Whose skillful hand is evident in every plan.
I am a living monster huge whose endless girth
Entwines and succors every nation of the earth.
I am the educator and the builder great;
Upon my footsteps progress of the world shall wait.
All things of human consequence do I embrace;
I am the conqueror of distance and of space.

—*Joseph S. De Ramus.*

And the Overhead.

"Are you sure you have shown me all the principal parts of this car?" asked the fair prospective purchaser.
"Yes, madam, all the main ones," returned the dealer.
"Well, then, where is the depreciation? Tom told me that was one of the biggest things about a car."

What Old Caesar Did.

When Cæsar took a westward ride
And grabbed the Gauls for Rome,
What was the first thing that he did
To make them feel at home?
Did he increase the people's loads,
And liberty forbid?
No; he dug in and built good roads—
That's what old Cæsar did.

Did Cæsar put the iron heel
Upon the foemen's breast,
Or did he try to make them feel
That Rome rule was the best?
What did he do to make them glad
As he came their lands amid?
He built good roads, in place of bad,
That's what old Cæsar did.

He built good roads from hill to hill,
Good roads from vale to vale;
He ran a good roads movement
Till Rome got all the kale;
He told the folks to buy at home,
Built roads their ruts to rid,
Until all roads led up to Rome—
That's what old Cæsar did.

If any town would make itself
The center of the map,
Where folks will come and settle down
And live in Plenty's lap;
If any town its own abodes
Of poverty would rid,
Let it go out and build good roads—
Just like old Cæsar did.

—*Author Unknown.*

(From Division VII.)

Doings Among Our Maintenance Foremen.

Cop—"How about your windshield?"
Carter—"Aw, this ain't no commercial vehicle."
Cop—"Tell that stuff to the judge."
And Carter did.

Nevada has equipped its state police with loadometers for the purpose of detecting overloaded motor trucks.

The federal aid policy accomplished far more than the mere granting of money to build good roads. It served to place the building and upkeep of public roads in the hands of trained engineering organizations by the requirements that construction of federal aid highways must be under the direction of competent state highway departments.—*Highway Engineer and Contractor.*

The map above does not show all of the state highways in California but only those included in the federal aid system, representing approximately 7 per cent of the total road mileage of the state, outside of cities. See article on federal aid on page seven of this issue.

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CALIFORNIA HIGHWAYS

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Above, the Pine Creek bridge on the state highway in the Cleveland National Forest, southern California; below, location of a forest highway leading to Lassen National Park, Lassen Peak in the background.

In this Issue: FOREST HIGHWAY PROJECTS IN CALIFORNIA.

Articles by PAUL G. REDINGTON, District Forester, and F. E. BONNER, District Engineer, United States Forest Service.

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N. T. EDWARDS, Commissioner, Orange — LOUIS EVERDING, Commissioner, Arcata

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SEPTEMBER 1924

California Highways

VOL. 1 No. 9

Highways Needed to Develop California's Forests

By PAUL G. REDINGTON, District Forester, United States Forest Service.

IN HER national forests, California has an unmatchable asset which is one of the very foundation stones in the economic structure of the great commonwealth.

Few realize what enormous treasure houses of raw materials their forests are. They comprise a vast area of government owned land aggregating over 19,000,000 acres, blanketing the great mountain ranges from Mexico to the Oregon line. They support a stand of merchantable timber estimated at 96,515,813,000 board feet. They supply summer forage sustaining 200,000 cattle and 473,000 sheep. Already various localities within the forest have yielded a vast amount of mineral wealth and still have deposits of incalculable value.

PAUL G. REDINGTON

The national forests of California contain most of the developed and potential water power which is so vital to the industrial progress of the state. They also are the source of most of the irrigation water supply upon which the extensive agricultural development of the state is founded and more and more the large metropolitan districts are reaching back into the higher mountains for their domestic water supplies.

Recreation Increasingly Important.

Aside from all these very tangible connections to the material progress and well-being of the community, the national forests are finding remarkably increasing favor as the summer playgrounds of the people. In fact, the rapidly increasing use of the forests for recreation promises to soon place this function equal in importance to the development of timber, grazing and water power. The forests also render a valuable service in the propagation of the wild life of the state.

Contrary to an impression held in some quarters, all these vast resources are not "bottled up" to be handed down to unborn generations, but are available now, to any citizen, for development and exploitation under reasonable and unburdensome restrictions, merely adequate to protect public interest and to insure a sustained yield of the forest products. Always, the Forest Service is striving to assure that the resources of the national forests fulfill to the limit their proper function in the rapid development and upbuilding of California.

Roads Pressing Need.

One of the most pressing needs of the forests is more adequate transportation facilities. A complete road system serving this far flung estate is essential not alone for proper management and fire protection but to open these resources to the people.

The great bulk of the forest area is now practically inaccessible and without a market. For illustration, the annual cut of timber at present is but 268,000,000 feet, out of the enormous total of 96,500,000,000 feet. The sale of even this much returns $877,000 a year to the United States Treasury. The annual growth will support a cut of at least 1,000,000,000 feet, which figured at present low stumpage would bring in $3,000,000 a year, perpetually.

The progress of logging is dependent largely upon good transportation and while in some cases railroads are required to conduct operations on a large scale, in many localities it is roads that are needed.

Recreation has increased so enormously in the last few years that the older roads are no longer adequate to handle the traffic and many new roads are necessary to open attractive recreation localities hitherto inaccessible. Statistics indicate that nowhere in the country are people "taking to the woods" as are Californians.

The problem of providing an adequate transportation system serving the forests must be met as a large cooperative enterprise. Many of the trunk highways traversing the forests are in the state highway system and thus serve a dual purpose by providing for through travel of statewide importance and for local development of the localities through which they pass. Many other roads are important links in the county systems and aside from the forest use

(Continued on next page.)

CONVENTION PLANS

IN THE October issue of the bulletin we hope to give complete information concerning the coming convention of the American Association of State Highway Officials which will convene in San Francisco during the middle of November.

The convention program is about complete and gives assurance of worth while discussion of the many problems that are being encountered by the various states in the construction of a great system of highways for America.

San Francisco business men, led by Chairman Harvey M. Toy of the highway commission, are arranging a typical California welcome and entertainment. Attendance from every state in the Union is expected. Delegates are urged to come to California by the northern routes and to leave via Los Angeles.

It is probable that arrangements will be made to take the visitors from San Francisco to Los Angeles by automobile over the coast and valley routes at the conclusion of the convention. This will give an opportunity for inspection of many miles of California state highway construction.

FAMOUS KLAMATH RIVER FOREST HIGHWAY PROJECT

THE VIEWS—1. Sidehill in the rugged canyon cleared ready for grading operations; 2, 3, 4, 6, scenes along the new grade shortly after its completion; 5 and 7, typical bridge sructures. Only a primitive trail existed before the road was built. The fifty miles of grading cost over $1,000,000.

FORESTS NEED HIGHWAYS

(Continued from page 3.)

serve important communities and industries. The rest of the roads in the system are primarily for forest development and administration, and, therefore, largely an obligation of the federal government alone.

With the forest road appropriations made by congress the Forest Service aims to forward improvement as rapidly as possible on all these three classes. Due largely to the splendid cooperation of the state highway commission, much progress already has been made toward the ultimate completion of the state's part of the forest highway system.

A march entitled "California Highways" and dedicated to Ben H. Milliken, superintendent of prison road camps, has been composed by D. G. Gallur, director of the San Quentin Military Band.

Sr. Manerto Cruz, engineer with the bridge department of the Bureau of Public Works, Manila, Philippine Islands, recently visited Sacramento while studying methods of the bridge department of the California Highway Commission.

H. E. Warrington, formerly head of the bridge department, is now in private practice and has opened office in the Underwood Building, San Francisco, in partnership with C. H. Kromer, formerly with the state division of architecture.

STATE FORCES COOPERATE IN SUPPRESSING FIRES

Agreement With Forest Service Brought Into Play—Prisoners in Camp at Briceburg Make Great Record.

LAST spring the California Highway Commission entered into an agreement with the United States Forest Service whereby employees of the commission were charged with the duty of assisting in suppressing fires adjacent to the state highways within the national forests. In several of the divisions this agreement has been brought into operation during the present summer.

Prisoners Volunteer.

One of the notable instances of cooperation was in Division VI where practically the entire Briceburg prison camp on two different occasions fought fires for several days in the forest adjacent to the Merced River.

The first fire occurred June 9th to 16th. Many convicts volunteered to fight the flames and worked for days on the fire lines. Again on August 6th, a second fire started and more of the prisoners volunteered. On one occasion a large number of prisoners were away from the camp from Wednesday until the following Tuesday and every man came back. At times, the camp had as high as 150 convicts and twelve free men on the fire lines at one time. The men fought fire willingly from eighteen to twenty hours without sleep or rest, only stopping from sheer exhaustion.

Superintendent W. B. Albertson has received a letter from Forest Service officials praising the work of the prisoners to which he adds his own commendation. There was not a single escape.

Employees of Division X twice cooperated with the Forest Service in fighting fires, on July 1st and 2d between Pine Grove and Cooks Station on the Alpine highway, and on September 6th on the Big Trees road. Thirty-two men in all were thus employed.

Maintenance forces of Division IV, on three different occasions between May 1st and July 15th, battled fires in the vicinity of the State Redwood Park. This was without the National Forest. Water tanks and pipe lines along the highway were threatened, the men confining their efforts to protecting state property.

Division VIII Active.

Division VIII reports that E. R. Samson, maintenance foreman at Beaumont, with a small force of men suppressed several fires at their inception along the highway right of way. L. H. Lucas, maintenance foreman in Waterman Canyon, also was successful in extinguishing a number of fires. For his work in fighting one large fire he was commended by Forest Supervisor R. H. Charlton of the Angeles National Forest.

Division Maintenance Engineer J. E. Stanton of Division VIII rushed state highway tools to the scene of a fire in the Big Bear section and materially aided in its suppression in its early stages.

Where the fires are within the national forests and representatives or employees of the highway commission are not responsible for their origin, the Forest Service has agreed to reimburse the state for the time of the men used in fighting fires at the current fire fighting wage.

CHITTENDEN PASS OPEN

DIVISION V is proud of the new 3.04 mile unit of state highway recently completed through the Chittenden Pass, San Benito County, connecting the coast trunk line with the improved highway system of Santa Cruz County. Work was begun October 9, 1923, and completed August 2 of this year.

In connection with the Pacheco Pass lateral, the Chittenden Pass road provides an almost direct connection between the San Joaquin Valley and the beaches of Monterey Bay, and also takes the place of an unimproved county road for much local traffic between Watsonville and Gilroy, San Juan, and Hollister.

The road was declared a state highway by special act of the legislature of 1921. Considerable heavy grading was done to improve alignment. The roadbed is 24 feet wide and is paved with asphalt macadam, 20 feet wide and six inches thick. The entire job cost approximately $88,000 or $29,000 per mile.

SCENE ON THE CHITTENDEN PASS—Note old meandering county road at left of new state highway.

An expression of thanks for the work done by the men of the Briceburg Prison Road Camp in fighting forest fires.

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
SIERRA NATIONAL FOREST

CAMP COERT DUBOIS, August 23, 1924.

SERGEANT E. J. HOBBS,
Camp E, Briceburg, California.

DEAR SIR: I want to take this opportunity of expressing my appreciation of the work done by the men under your supervision.

The rangers report that the men showed unusual good spirits in helping out and their service is appreciated.

There were some very outstanding individuals but unfortunately we did not get their names, but I wish you would express to all your men our appreciation of their work.

Very sincerely yours,
(Signed) M. A. BENEDICT,
Forest Supervisor.

THE FOREST ROAD SYSTEM OF CALIFORNIA

By F. E. Bonner, District Engineer, United States Forest Service.

THE provision of adequate transportation facilities serving the national forests is one of the most difficult and spectacular features of the country's highway program. By their very nature, the national forests consist in general of the most rugged, the most densely timbered and the least developed regions of the entire country. Twenty years ago, when the Forest Service first became charged with their administration, it found vast areas without transportation routes of any kind.

Under the circumstances one of the first big tasks was to plan out and begin the construction of a comprehensive road and trail system. Funds were very limited in the earlier years and the initial work had to be confined largely to the building of pack trails for the rangers to reach the more important localities.

In response to an increasing demand for better facilities, congress, in 1912, authorized the Forest Service henceforth to use for road and trail construction 10 per cent of the receipts from the sale of timber and other forest products. This appropriation, called the "10 Per Cent Fund," permitted a substantial start on the forest road building program which has progressed at an accelerating rate ever since.

Congressional Appropriations.

In 1916, congress made another appropriation amounting to $1,000,000 a year and running for a period of ten years. This act is still in force and the last appropriation will be that for the fiscal year 1926. This appropriation is termed the "Section 8 Fund" and the expenditures are reimbursed to the treasury from the forest receipts.

In recognition of the need for more rapid progress on the forest system, the "Federal Forest Road Construction" appropriation of $9,000,000 was made in 1919.

Again in the fall of 1921, with current funds nearing exhaustion, congress appropriated $15,000,000 more for forest roads and trails. This act specifically provided for two distinct classes of roads. First, there was set aside under the designation "Forest Highway Fund" $9,500,000 of the appropriation for those roads in the national forests needed particularly for public travel and primarily important from the standpoint of completing the parts of the state system and the county roads traversing the forests.

Thus does congress recognize the obligation of the United States as a large land proprietor and reimburse the local agencies for the loss of taxable revenues from areas permanently under federal control.

The other part of the 1921 act set aside $5,500,000, called the "Forest Development Fund," for the roads and trails needed primarily for the protection and development of the forests themselves.

For the past two years appropriations of $6,500,000 a year have been made under the same provisions governing the 1921 appropriation. Of each appropriation, $3,500,000 was apportioned to the Forest Highway Fund and $3,000,000 to the Forest Development Fund.

The following tabulation summarizes the forest road appropriations to date and shows the share apportioned to California from each:

Appropriation	*Total*	*California share*
10 Per Cent Fund	$4,591,149 60	$731,889 42
Section 8 Fund	9,000,000 00	1,175,395 00
Federal Forest Road Construction	9,000,000 00	1,176,619 87
Forest Highway Fund	16,500,000 00	2,527,632 00
Forest Development Fund	11,500,000 00	1,399,270 00
Total	$50,591,149 60	$7,010,806 29

These appropriations combined with substantial cooperation from many of the states and counties have made possible the construction of a great many of the more urgently needed projects.

The program carried out under the Forest Highway Fund is worked out in cooperation with the state highway departments and the standards of construction approximate approved practices in the respective states. Through a cooperative arrangement, construction work on the forest highways is supervised by the United States Bureau of Public Roads, while the construction of the forest development roads and the trails is carried out directly by the field organization of the Forest Service.

Notable Forest Projects.

Forest road building in California has resulted in the construction of a number of notable projects. Prominent among these is the fifty miles of highway built in Siskiyou County down the rugged canyon of the Klamath River from Happy Camp to Orleans, where before only a primitive trail existed. This project alone required the expenditure of nearly $1,250,000. A similarly difficult project, under way for a number of years, and now in prospect for completion in 1925, is the road down the Salmon River canyon in the Klamath Forest. Other important roads completed include the Laguna Mountains highway in San Diego County and the Huntington Lake road in Fresno County.

The present program is contributing in an important way toward the improvement of the mountain units of the state highway system. A section of the Trinity River lateral has been finished and work is now in progress on extensive sections of the Cuyama lateral in Santa Barbara County, the Big Bear Lake highway in San Bernardino County, the Red Bluff-Susanville highway, the Sonora-Mono lateral, the Colfax-Truckee highway, and the Crescent City-Grants Pass connection, in Del Norte County.

Among the more important roads in the local county systems now under construction are the Yuba Pass road in the Tahoe National Forest, the road from Murphys to the Calaveras Big Trees grove in Tuolumne County and the San Marcos Pass road in the Santa Barbara Forest.

Concurrently with the undertaking of these larger projects primarily important from the standpoint of public travel, there are being completed by the Forest Service, under the forest development road activities, a great number of the

(Continued on next page.)

CALIFORNIA FOREST HIGHWAY PROJECTS

THIRTEEN forest highway projects, located on the California state highway system, have been completed or are now under construction with funds supplied by the United States Forest Service. The state highway commission is cooperating on six of the projects, the others are being built exclusively with federal funds.

The work now under way involves the ultimate construction of more than 200 miles of highway at a cost of millions of dollars. Expenditures on August 31, 1924, as reported by the Bureau of Public Roads, had reached a total of $3,436,811.

This assistance in the construction of the highway system is in addition to regular federal aid appropriations and is a recognition of the obligation of the federal government because of its ownership in California of millions of acres of valuable forest lands.

The following table gives data on the forest projects on the state highway system:

FOREST HIGHWAY PROJECTS ON CALIFORNIA STATE SYSTEM

Project name	National forest	Lgth. miles	Type	Part completed	Expended to Aug. 31, 1924	State's share of cost
Big Bear Valley	Angeles	13.2	18-ft. grading	78%	$420,539	$210,000
San Gabriel	Angeles	12.0	18-ft. grading	1.4 mi. built	187,914	150,000
Arroyo Seco	Angeles	3.8	18-ft. grading	3.8 mi. built	140,071	----------
Klamath River	Klamath	49.0	8-ft. grading	completed	1,190,592	none
Red Bluff-Susanville	Lassen	12.0	16-ft. grading and graveling	66%	165,692	50,000
Alturas-Cedarville	Modoc	23.4	18-ft. grading and graveling	7.7 mi. built	132,430	gravel surf.
Redding-Alturas	Modoc–Shasta	10.9	14-ft. grading and graveling	98%	204,902	none
Cuyama	Santa Barbara	15.5	18-ft. grading	75%	437,044	210,000
Sonora Pass	Stanislaus-Mono	13.3	16-ft. grading and graveling	no const.	6,290	none
Truckee-Tahoe	Tahoe	14.0	18-ft. grading and graveling	no const.	1,082 (surveys)	none
Emigrant Pass	Tahoe	3.7	20-ft. grading and graveling	22%	33,138	none
Trinity River	Trinity	4.7	8-ft. grading	completed	92,117	none
Crescent City	Siskiyou	27.2	16-18-ft. grading and graveling	33%	425,000	553,000
Total	----------	202.7	----------	----------	$3,436,811	----------

FOREST ROAD SYSTEM

(Continued from page 6.)

more local roads. Generally these are built on rather modest standards and while intended primarily for fire protection and administrative purposes, they serve a wide use in allowing the public access to attractive recreation points away from main arteries of travel.

Big Task Ahead.

Altogether, forest road building activities in California have resulted in the construction of nearly 700 miles of road and the improvement of many miles more of the roads already existing. While this constitutes an impressive start, the major part of the work still remains to be done.

The comprehensive plan which has been worked out shows the ultimate forest road system in California will involve probably 7,300 miles. It is estimated its completion will entail a further expenditure of $35,000,000, possibly more.

GREELEY IN CALIFORNIA

Col. W. B. Greeley, chief forester of the United States, has been spending the greater part of the summer in California to assist during the period of fire hazard.

IOWA SUPERVISORS FAVOR GASOLINE TAX

Iowa supervisors, facing increased demands for highway expenditures, by resolution called upon the legislature to pass a gasoline tax to produce revenue for the highway funds. The resolution declared it was an equitable means of raising the needed revenue.

The supervisors also passed a resolution asking that a limit be placed on trucks and passenger busses using public highways to protect the surfaces which are now being rapidly run down by overloaded machines.—*The American County.*

SECRETARY MIXON MARRIES

THE newspapers on Saturday morning, September 12th, brought a thrill of surprise to the State Highway Department with the announcement of the marriage in San Jose, the day before, of Secretary W. F. Mixon and Mrs. Edna Mahr, formerly of Woodland, Mr. Mixon's home town.

The happy couple received congratulations from many friends throughout the state when they returned to Woodland where they will make their home.

Headquarters expressed its esteem of Secretary and Mrs. Mixon by presenting them with a handsome silk down comforter as a wedding gift.

HIGHWAY RECONSTRUCTION PROBLEMS ENCOUNTERED ON THE SACRAMENTO-STOCKTON ROAD

By J. C. McLeod, Division Engineer, Sacramento.

ONE of the pressing problems facing the California Highway Commission is the need for the reconstruction of a considerable mileage of old county built roads, incorporated into the state highway system at various times since 1912.

Most of these roads are from ten to fifteen years old, and, measured by the needs of present day traffic, are of inferior types of construction. Road building, at the time they were designed and constructed, had not reached the comparatively high standards of the present day, nor was the enormous increase in motor vehicle traffic anticipated.

Many miles of these roads are a part of the main trunk highways that traverse the length and breadth of the state. They are being subjected daily to loads and speeds far beyond their capacity, and, as a result deteriorate badly, with resulting high annual maintenance charges. The solution of this problem is the rebuilding of these roads with a modern hard surfaced pavement.

Subbase Not Disturbed.

It has long been an axiom among engineers that every section of highway presents problems that are peculiar to that particular section. In reconstruction work, it is the utilization of the existing road surface, so that the benefits of its thorough settlement under years of travel may be incorporated into the new pavement.

The following is a brief summary of the magnitude of a representative reconstruction job, on the Sacramento-Stockton highway, along with a short exposition of the methods used and some conclusions drawn therefrom.

The section of state highway recently reconstructed extends from the south limits of Sacramento in a general southerly direction for a distance of thirteen miles. The original pavement consisted of an oil bound macadam constructed by Sacramento County in 1910. The road, itself, is a part of the main highway extending from the Oregon line to Los Angeles, via the San Joaquin Valley, and is also on the route of the transcontinental Lincoln highway. It was taken over as a part of the state highway system in July, 1915.

During the last few years, annual maintenance charges on this section became so excessive that its reconstruction was imperative. After a thorough study, a Portland cement concrete pavement was decided upon. For the first three miles south of Sacramento, where suburban travel is heavy, the new pavement is twenty-four feet wide. For the balance of the job a twenty-foot width was deemed sufficient. The pavement is six inches thick at the center and is thickened in the outer three feet on each side from six to nine inches.

We desired to take advantage of the well settled oil macadam road as far as practicable, but due to its excessive crown and corrugated and broken surface, the new pavement could not be placed directly upon it without using an excessive amount of concrete to fill irregularities.

Oil Macadam Scarified.

The problem was solved by requiring that the oil macadam be scarified and thoroughly broken up, reshaped to the new required width, and compacted with rollers to ultimate compression. Care was taken to scarify only to the depth of the old pavement, the earth grade remaining undisturbed. During construction, this phase of the work presented two major problems as follows:

First, when work began in the spring the temperature as a whole was low. As a result, the asphalt binding of the old pavement was solidified, and its breaking up proved difficult. After the weather warmed up, all difficulties on this score vanished and rapid progress was possible.

The experience with this job, however. indicates the advisability of confining work of this character to the hot summer months to obtain the best bid prices.

The second problem had to do with the impossibility of constructing a true template subgrade out of a material containing so much rock. The tendency of the contractor was to get the subgrade low, which would in turn upset the proportion of the materials over that required by theoretical measurement. This was overcome by placing a thin cushion of sand on the subgrade, removing all inequalities and bringing the surface to grade. This proved a good solution in more ways than one. It provided an ideal subgrade and where the sand cushion was placed the transverse expansion cracks appear fewer in number than where no sand was used.

Modern Equipment Used.

The job required the mixing and placing of 29,000 cubic yards of concrete. Materials alone entering into this quantity of concrete would require a railroad train over ten miles long and the material would weigh 152,336,000 pounds. The thirteen miles of pavement were poured in 108 days, including all delays, or a grand average of 270 cubic yards of concrete, approximately 700 lineal feet of 20-foot by 6-inch pavement per day.

A part of this job was constructed from a central mixing plant, the concrete being hauled to the job in trucks. The balance of the job was done using a central proportioning plant, the mixer being on the grade. This mixer was of exceptionally large size and was built especially for the Kaiser Paving Company, the contractors on this unit. The material was hauled to the mixer on an industrial railway.

Using this equipment, the contractor averaged over 1000 lineal feet of pavement per day for the last six miles of this contract.

Experiments with calcium chloride for "curing" purposes were made during the progress of the work. Due to the very low humidity at the time it was used, it constituted a severe test as to the practicability of the calcium chloride method. The surface appearance of the concrete thus treated is good, and data from core cylinders show a breaking strength almost identical with that of dyked and ponded concrete on the same section. The cost of calcium chloride appears to be the same or a little higher than the dyking and ponding method heretofore used.

(Continued on page 11, column 2.)

THE SACRAMENTO-McCONNELL PAVING JOB—1 and 2, views showing difficulty of scarifying oil macadam during cold weather; 3, section of completed highway just before final finish; 4, showing ease with which scarifier worked in warm weather; 5, dumping concrete hauled from central mixing plant, note stiff consistency; 6, spreader box used for spreading concrete hauled in trucks from central mixing plant; 7, method of applying calcium chloride for "curing"; 8, joint holder for longitudinal center expansion joint; 9, mechanical finisher operating in foreground; 10, another view of mechanical finisher, men in background operating longitudinal float; 11 and 12, views of the big mixer used on the latter part of the job; 11, shows hoisting of aggregates prepared at the central proportioning plant. The locomotive of the industrial railway is shown in 12.

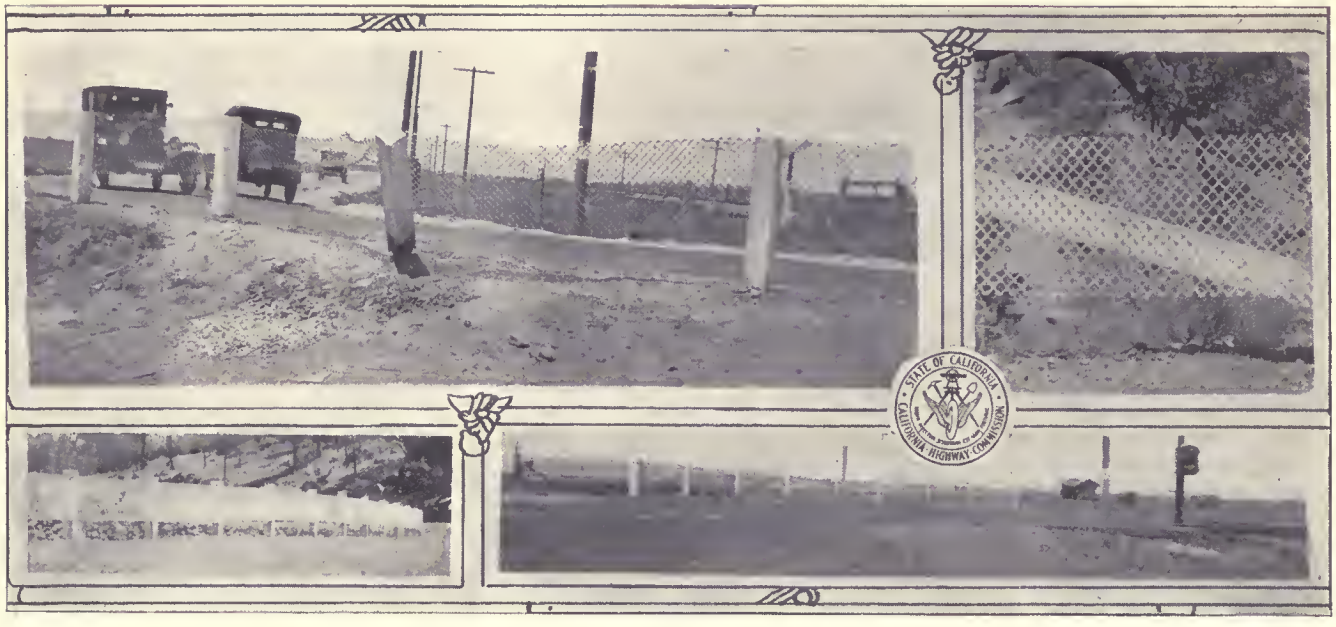
True to Life.

Smith—"I wish I had one of the crisp rolls that mother used to make."

Mrs. Smith—"Yes, and I wish you had one of the crisp rolls that father used to carry."

Tardy Student—"Well, a sign down here—"
"Well, what has a sign got to do with it?"
"The sign said: "School Ahead Go Slow."

The difference between Satan and the road department is that the former makes his detours more enticing.—*Knoxville Journal.*



WIRE NET GUARD FENCE STOPS CAR—Upper left, near Oceanside, San Diego County, wire net fence with post broken, but wire net intact; upper right, detail section of the fence; lower right, view of the crossing before accident; lower left, same type of fence in Division VI.

NEW GUARD FENCE TRIED IN SOUTH

(From Division VII)

FOR EXPERIMENTAL purposes sixty-four feet of wire net guard fence recently was erected on the outside of a sharp curve at the Santa Fe Railroad grade crossing just north of Oceanside, on the State Highway, Route 2, San Diego County.

The twenty-four-inch fence fabric is supported by six-inch posts, eight feet apart and set three feet into the ground. The two end posts were made from ten-inch piling set about five feet into the ground.

Cost of Fence.

24-inch fence fabric, 64 feet at 40 cents f. o. b. job	$25 60
9 posts at $1.25 f. o. b. job	11 25
Erecting 64 feet at 30 cents (per Brassington)	19 20
Staples and paint at 5 cents (64 feet)	3 20
Cost of 64 feet	$59 25
Cost per foot (material and labor)	925

Result of Collision.

Shortly after the installation of the guard fence it was struck by a Ford sedan. One six-inch by six-inch post was broken off at the ground, and the wire fabric to adjacent posts (sixteen feet in all) was badly stretched, but not broken. The Ford sedan was only slightly damaged and was repaired and on its way in about an hour.

The fence was repaired by cutting out the two eight-foot panels of wire, stretched by the collision, and installing a new post and sixteen feet of new wire net.

The cost of repairs amounted to about 95 cents per lineal foot or slightly more than the cost per lineal foot for erecting the original fence.

It is believed the use of eight-inch by eight-inch posts, set four feet into the ground, would improve this type of guard fence.

FOREST SERVICE OFFICIALS

SEVENTEEN national forests, with a net area of over 19,250,000 acres, are under the jurisdiction of the officers of the California District of the United States Forest Service, with headquarters in the Ferry Building, San Francisco.

Paul G. Redington, district forester, heads the service in this state. He is assisted by the following corps:

Robert L. Deering, assistant forester, in charge of *Operation;* T. D. Woodbury, assistant forester, in charge of *Forest Management;* Jesse W. Nelson, assistant forester, in charge of *Grazing;* L. A. Barrett, assistant forester, in charge of *Lands;* W. I. Hutchinson, assistant forester, in charge of *Public Relations;* C. L. Hill, in charge of *Forest Products;* S. B. Show, silviculturist, in charge of *Research.*

F. E. Bonner is the district engineer of the Forest Service and E. W. Kramer is the hydro-electrical engineer.

NEW FILLER COSTS LESS

BECAUSE of variations in temperature, expansion joints are now being provided in all concrete paving on California state highways. The present policy calls for installation of joints at 100-foot intervals, instead of placing them wherever the pouring of concrete happens to stop at noon and night, as was formerly the practice. In the past, these joints have been filled with a patent filler somewhat expensive and declared lacking in various necessary qualities.

The department worked out its own filler, the formula being nothing more complicated than sawdust and asphalt, a mixture of which makes a contraction joint filler more satisfactory than any yet tried, the cost being less than that charged for the patent filler formerly used.

McKESSON IS NAMED

State Highway Engineer R. M. Morton announces the appointment of C. L. McKesson, research engineer on the staff of the testing laboratory, as the representative of the California highway department on advisory board on highway research of the National Research Council. Valuable research work is being carried on by the council at its headquarters in Washington, D. C. Each state is represented on the advisory board.

MAINTENANCE SUPERINTENDENT BUILDS PAVEMENT MARKER

A ONE-MAN pavement marker mounted on a motorcycle side car frame is now in service in Division II in the vicinity of Red Bluff.

The outfit was designed and built at the Red Bluff maintenance yard under the supervision of F. L. Stump, maintenance superintendent, and is used to paint guide lines in the center of the pavement on bridges, curves, and at other places where they may add to the safety of traffic.

The apparatus consists of a marker wheel with a felt tire hung on an eccentric axle with a lever attached by which it may be raised or lowered from the pavement, a fifteen gallon asphalt or paint container with a feeder pipe and valve to the wheel, and a fifteen-gallon sand container with a spreader pipe to the rear of the marker wheel.

Operation Simple.

The asphalt feed pipe valve and the sand feed pipe valve are both operated by the same lever. The operator has but two motions to perform, lower the marker wheel, and turn on the asphalt and sand.

A collapsible rod extends to the edge of the pavement to keep the wheel in the center of the highway. A low gear engine sprocket makes it possible to operate the machine at a speed as low as 2½ miles an hour. The cost of operation, including labor, equipment rental, and materials, Stump reports, is not in excess of 40 cents a mile.

Division IV also has built a simple one-man pavement marker as shown in the illustration below.

ABOUT GRAVEL ROADS

(From *Western Highways Builder.*)

A TWO-WEEKS journey over the Pacific highway and several important tributary roads from San Diego, California, to Seattle, Washington, leads to the conclusion that the properly built, efficiently maintained gravel-surfaced road is as satisfactory a type of construction as any rational individual could ask for.

The Western Association of State Highway Officials recognizes the pertinent fact that this type of road will carry the majority of the traffic in the public land states for some time to come, and has appointed a committee to investigate and report on successful methods of construction and maintenance.

To this committee I would suggest a trip over the Pacific highway from Sisson to the Oregon state line where Robert Morton has created a high-speed, albeit gravel boulevard from a most uncomfortable and treacherous stretch of road. This section of the California state highway system is carrying 1200 to 1500 vehicles a day without serious difficulty.

In Oregon, a similarly fast road has been built between Medford and the boundary of Crater Lake National Park and between Klamath Falls and the Pacific highway, by the Oregon highway commission. These three roads permit of a speed, with comfort and safety, of 35 to 45 miles an hour. Little more could be asked for.

One doesn't have to search far for the secret of this successful road service. It lies in small gravel and constant, continual, efficient maintenance.

RECONSTRUCTION PROBLEMS

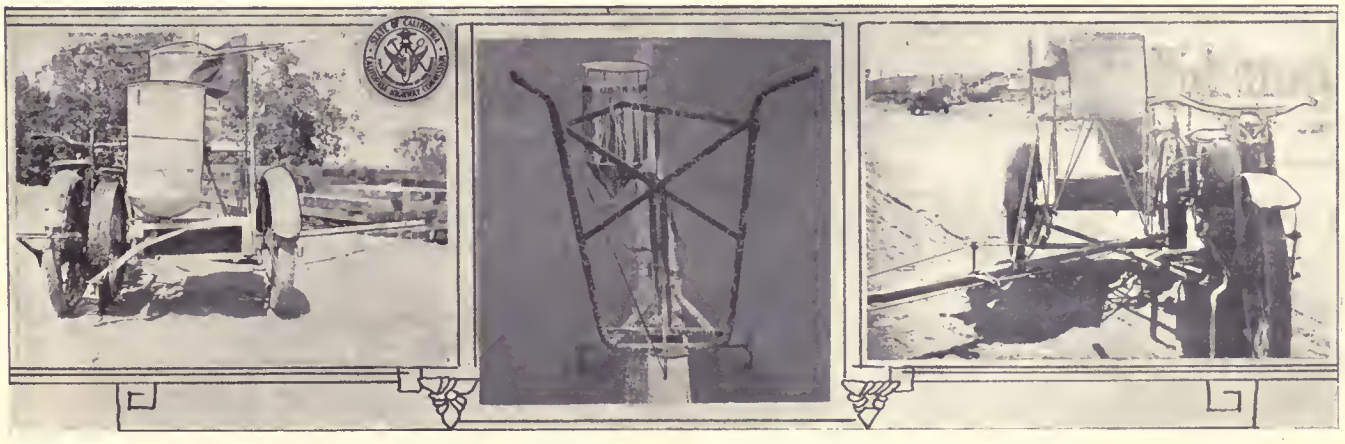
(Continued from page 8.)

Vialog Tests High.

The completed road presents a smooth, safe and pleasing appearance. Vialog tests show only twelve to sixteen inches of roughness per mile. This is a remarkable record considering that New York specifications, where the vialog has been extensively used, permit a maximum of fifty inches per mile. The old oil macadam has a record of 196 inches of roughness per mile.

The total cost of the thirteen miles of paving was approximately $420,300, or $32,250 per mile. It was financed from the gasoline tax fund, and is one of the largest projects on the state system completed to date with funds from this source.

All who have had to do with the construction of this road feel that high standards of highway construction have been adhered to and it is hoped that the community it serves and the public at large will feel a measure of pride in the work accomplished.



NEW PAVEMENT MARKERS—At left and right, views of the pavement marker mounted on a side car, the work of maintenance superintendent in Division II; center, one-man pavement marker in use in Division IV.

WHAT THE DIVISIONS ARE DOING

Progress at Van Duzen.

THE reinforced concrete bridge across the Van Duzen River, about twenty miles south of Eureka, is rapidly taking form as the contractors rush the work in anticipation of the coming winter. A diver, working on the cofferdam of one of the piers, attracted the attention of tourists recently. Many motorists spent hours at the bridge site watching operations.

The bridge department reports the site of the great Klamath River bridge, at Requa, Del Norte County, a busy place these days. Contractor F. Rolandi has a sawmill, blacksmith shop, and other activities under way. Preliminary work has been begun on one of the piers. Several pile drivers are on the job.

The big grading contract in the vicinity of Fresh Water Lagoon, Division I, soon will be reported 100 per cent complete.

Ten Miles More of Paving.

The length of unpaved highway between Redding and the Oregon line, on the Pacific highway, Division II, was reduced by ten miles during September when the Kaiser Paving Company completed its operations north of Redding. This splendid new pavement, twenty feet wide, will be opened to traffic early in October.

Rapid progress is being made on the new Division II shop building at Redding. Construction also has started on the new division office building, also located in Redding.

The Nevada Contracting Company soon will have completed its widening contract from Bayha to Half Way Creek, in Shasta County. The work is far ahead of schedule.

Grading operations soon will be started by Dunn and Baker of four miles of widening work on the Pacific highway along the Klamath River. Culvert work is nearing completion. The grading is an extension of their previous contract completed early in the summer.

Polk and Polk have about completed their contract for the rock surfacing of the Susanville lateral between Chester and Westwood.

Hearings Held on Underpasses.

Plans have been completed by Division III for the construction of a ground level road from the American River bridge to North Sacramento and further progress is awaiting action by the State Railroad Commission upon the application of the highway commission for the elimination of two railroad grade crossings on this same section. The bridge department submitted its plans for the underpasses at the recent hearing.

The commission has allotted $1,000 for an investigation of the best means of eliminating the Ben Ali grade crossing over the Southern Pacific, just beyond North Sacramento.

A contract has been let to the Chico Contracting Company for the paving of 1.7 miles on the Chico-Orland state highway, near Chico, with asphalt concrete. Plans have been completed for the grading of approaches to the new Stony Creek bridge on the same route.

The main eastside trunk line between Marysville and Roseville presents a greatly improved appearance following the lengthening of culverts and removal of unnecessary guard rails.

The commission has approved an allotment of $5,000 for cooperative work with the Glenn-Colusa Irrigation District in the construction of drainage ditches adjacent to the state highway on the Sacramento Valley westside trunk line.

State forces have begun the grading and surfacing of a mile of state highway at the north end of Lake Tahoe to connect up with the Nevada highway on the east side of the lake.

Construction has been begun by Proctor and Cleghorn on their contract for the construction of a 398-foot bridge across the Truckee River and the Southern Pacific railroad at Polaris, Nevada County, on the Truckee River highway.

Cleaning and painting of bridges across the Sacramento River and Butte Slough on the Oroville-Willows lateral, in Glenn County, Division III, has about been completed by Jenkins and Elton of Sacramento.

Bay Shore Highway Begun.

BEFORE a great concourse of people, including Chairman Harvey M. Toy of the highway commission, Mayor James Rolph of San Francisco, supervisors and others from San Francisco and the peninsula cities, Division IV early in September celebrated the beginning of construction on the Bay Shore highway when the first earth was moved by D. A. Foley and Company of Los Angeles, contractors. The contract covers grading of the first 5.2 miles.

The concrete pavement on the Beltane-Schellville contract, in Sonoma County, has been completed and opened to traffic as far as Fetters Springs. The entire contract will be completed shortly.

Laying of asphalt concrete surfacing has been begun by contractors Freeman and Whiting on the contract for the widening of the Peninsula highway between Redwood City and San Francisquito Creek.

Grading has been completed by contractor W. A. Dontanville, who is widening the highway between Greenville and Livermore, Alameda County. Pouring of "flush" concrete shoulders has been begun.

Coast Unit Completed.

Division V reports the completion of the extension of the Blake and Heaney contract for the grading of a section of the San Simeon-Carmel highway, 2½ miles in length, from the northern San Luis Obispo County line to Salmon Falls, in Monterey County. The same firm had previously completed the grading and surfacing of ten miles south of the San Luis Obispo line. The road literally has been carved from the steep hillsides hundreds of feet above the Pacific Ocean.

A new impressive concrete girder bridge has replaced the old wooden county span over San Lorenzo Creek at the southern city limits of King City, Monterey County. State forces, under the direction of Division V, are now rushing the paving of the approaches. Monterey County and King City are cooperating with the state in meeting the cost of paving the quarter-mile gap in the highway which has existed at this point.

Shoulders Improved.

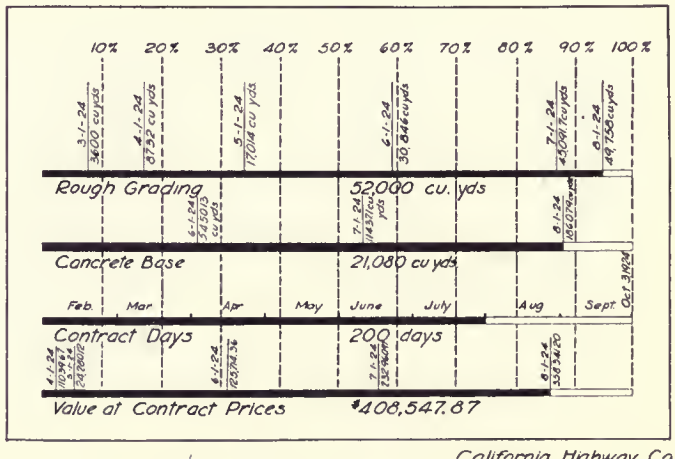
Division VI reports that the sand shoulders along the highway between Tipton and Earlimart, on the San Joaquin Valley trunk line, have been oiled and the cost of pavement maintenance cut down for a distance of fifteen miles.

Cottages for maintenance foremen have been constructed on the recently acquired maintenance station sites at Lemon Cove, Los Banos, and Lost Hills, all in Division VI.

Whittier Paving Rushed.

THE Belvedere Gardens Chamber of Commerce has written a letter to the contractors engaged in widening and thickening the Whittier boulevard, a state highway in Division VII, commending them on the rapid progress of the work. Laying of the concrete base has been completed and placing of the asphalt concrete surfacing is well under way.

Subcontractors have begun pouring concrete on the Huntington Beach-Corona Del Mar contract on the coast boulevard. The work has been begun at the Huntington Beach end of the job.



PROGRESS CHART—Method used by Division Engineer S. V. Cortelyou to keep tab on a big reconstruction job in Los Angeles County.

DIVISION ACTIVITIES

Contractor W. D. McCray has begun operations on the grading job between Corona Del Mar and Laguna Beach on the coast boulevard, recently awarded by the commission.

The bridge over Anaheim Bay, on the same route, built by Orange County has been completed and accepted.

State forces have completed the improvement of alignment on blind curves on six miles of the ridge route, Los Angeles County, and are now at work on a line change through the Callahan Ranch which will eliminate six curves.

The widening and thickening of the Ventura boulevard between the Ventura County line and Camarillo has been completed westerly to the top of the Conejo grade.

On the same route, the Oswald contract between Shoup avenue and the westerly boundary of Los Angeles County is about complete. Concrete paving has been completed and shoulder work is being finished.

Over seven miles of pavement have been completed on the Jahn and Bressi contract for widening and thickening the state highway between San Diego and Oceanside.

Celebration Planned.

Grading operations between the sand hills and the Colorado River, on the Borderland highway, Division VIII, are rapidly nearing completion. A tour over this route as far east as El Paso, Texas, in celebration of the event, is planned by a group of San Diego citizens.

East of the Sierras.

Division IX has completed work planned for the present on the surfacing of Sherwin Hill twenty miles north of Bishop, Inyo County, and the widening of the eight-foot pavement, south of Big Pine, by the use of volcanic cinders.

Borrowed Earth for Shoulders.

ON the Sacramento-McConnell paving job, recently dedicated with a public ceremony at Old Elk Grove, shoulders across adobe sections have been built up with new loam soil "borrowed" and hauled to the highway in trucks. The bridge department still has several bridges under construction.

Surveys and field work for the Jackson-Pine Grove unit of the Alpine highway have been completed and chief of party C. W. Springer and transitman Arthur Wallace have been transferred to the Banta widening and thickening job in San Joaquin County, as assistant resident engineers.

Good progress is reported on the Vacaville-Dixon widening and thickening contract in Solano County. The half mile of second story concrete work over the hill, east of Vacaville, has been sublet by Force and Currigan to Leventon and Heintze, former assistant division engineers in Division III.

Magnesium chloride has been applied to a section of road between Wallace and Burson, in Calaveras County, with good results.

Timber is being prepared for the reconstruction of two bridges over the south fork of the Tuolumne River on the Big Oak Flat road.

Funds have been allotted for the installation of fog signals and the extension of the signal system on the bridge over the Sacramento River at Rio Vista.

A new concrete structure is being built to replace an obsolete wooden bridge over Monitor Creek and a new top is being placed on the timber bridge over West Carson River, on the state highway in Alpine County.

The famous "joy bump" on the highway between the Stanislaus River and Salida on the San Joaquin Valley trunk line, has been eliminated at a small expense by the maintenance forces of Division X.

INITIATIVE OPPOSED

The Madera County Farm Bureau has gone on record as opposing the initiative measure proposed by the motor transportation interest of the state which will be voted upon by the people at the November election. The bureau asserts that the proposal, if ratified, will take away from the cities and counties the right to license and regulate stage lines and gives nothing in return.

DIVISION IV JOBS—Above, scene on recently widened and thickened section of highway near Milpitas, Santa Clara County; below, road in the California Redwood Park widened by state forces.

DESERVES CREDIT

(From the Placerville *Republican.*)

ROADMASTER SACKETT, who is in charge of the maintenance of the state highway between this city and Folsom, certainly deserves a great deal of credit for the good work he is doing all along this stretch of road. He is making his maintenance money go just as far as possible and is stretching it so well that every month sees a few more of the curves widened and the roadbed kept in good repair.

Such work as he is doing will do much to help motorists and visitors enjoy their trips along this highway.

Illuminated warning erected on the Sacramento-Stockton road by the Bridge Department.

CALIFORNIA HIGHWAYS

OFFICIAL PUBLICATION OF THE

CALIFORNIA HIGHWAY COMMISSION

SACRAMENTO, CALIFORNIA

HARVEY M. TOY, Chairman;
N. T. EDWARDS and LOUIS EVERDING, Commissioners.

ROBERT M. MORTON, State Highway Engineer.

W. F. MIXON, Secretary.

We are pleased to permit publication of any of the matter contained herein and this privilege is extended newspapers and periodicals without restrictions.

FRANK B. DURKEE - - - Editor
P. O. Box 1103, Sacramento, California.

Vol. I. SEPTEMBER, 1924 No. 9

JUST AMONG OURSELVES

☆ ☆ ☆

HIGHWAY NEWS NOTES

Harry Pearce Weds.

HARRY J. PEARCE, popular assistant accountant at headquarters, had the honor of being the groom at the first wedding to be solemnized in the new Hotel Senator, Sacramento. His bride was Miss Tessie Colston Krieger of Kentucky and the ceremony was performed on August 26th.

The secret of the coming affair leaked out shortly before it was to occur and Harry's friends in the accounting department tendered him a surprise luncheon and freak shower several days before the wedding. They also presented the happy couple with a handsome floor lamp as a wedding gift.

Mrs. Fay Barrett enjoyed a vacation at Echo Lake and says she caught a great big trout.

Issues Warning.

Purchasing Agent L. R. Smith is taking no chances. His new steno is a "Mrs.", who takes the place of Mrs. Carl Almquist, *nee* Miss Judith Younggren. Mrs. Ilo Baumgart recently accepted the position, which was the occasion for a warning by Smith that he will expect a year's notice hereafter when the young women of his well trained staff plan to embark upon the "sea of matrimony."

Mr. Morton on Vacation.

STATE Highway Engineer R. M. Morton and Mrs. Morton, while on a short vacation, motored to Victoria, British Columbia, returning during the latter part of the month.

Others from headquarters who have been on vacations recently include: L. V. Campbell, assistant office engineer, who spent several weeks inspecting state highways in southern California; R. S. Badger, of the maintenance department; and William Bock of the drafting department.

Turns School Teacher.

Mrs. Edith Rolston, for four years clerk in the division office at Dunsmuir, has resigned to accept a position as teacher in the Dunsmuir schools. She has been succeeded by Mrs. Augusta Mitchell of Sacramento.

F. E. Davis, draftsman, was among the Division II force who visited Crater Lake this season.

Lawrence Pierce, draftsman, and Ed Shelton, maintenance foreman, recently scaled Mount Shasta.

Eli Dallas, draftsman, is moving his family to Redding.

Mrs. M'Dell Payne, typist has returned from a vacation in San Francisco.

Earl McNeely Once With Division III.

Earl McNeely, former Sacramento Coast League ball player, now creating a sensation with the Washington club of the American League, is claimed by Division III. He was formerly an engineering assistant in the division. Jim O'Connell, sold by San Francisco to the New York National League club, was a rodman in Division III in 1918. Such is fame.

W. C. McNeely and W. F. Faustman spent their vacations visiting Santa Cruz and other beach resorts. The hunting must have been good as they report having shot several "birdies" and "eagles" while trying out the golf courses.

Other Division III folks who have been on vacations include: F. R. Baker, Mrs. Mary Brown, and Misses Helen Edwards, Garland Taylor, Lucille Steers, and Rose Mulligan.

Mrs. Irma Beardslee, typist, has resigned.

H. R. Church, assistant resident engineer, reported resigned is still with Division III.

George W. Wade, assistant maintenance engineer, has moved into his new home in Heilbron Oaks, Sacramento.

Douglas H. Greeley is constructing a new home in the McKinley Park district.

Division IV Changes.

Niles H. Nelson, resident engineer, and Joseph L. Richmond, assistant resident engineer, has been transferred from the Beltane-Schellville contract to Susanville, in Division II. R. E. Messner, who has been acting as Division IV office engineer, has taken over Mr. Nelson's duties.

Resident Engineer E. J. Brown has been assigned to the asphalt surfacing job between Redwood City and San Francisquito Creek on the Peninsula highway, following the completion of the Milpitas-Coyote Creek widening job in Santa Clara County.

Resident Engineer L. C. Winkelman has been assigned to the Bay Shore highway contract.

L. A. Batham, chief draftsman, returned recently from a vacation in Humboldt and Mendocino counties where he is reported to have mysteriously acquired quite an appetite for sweets.

Leaves Division V.

W. L. Judkins, formerly resident engineer in Division V, has purchased interests in a construction company specializing in the laying of a mastic asphaltic floor covering for bridges, etc. He proposes to introduce improvements tried out on several state highway bridges.

Voss to Bakersfield.

T. W. Voss, formerly resident engineer in Division II, has been transferred to the prison road camp job on the Kern River as assistant superintendent.

H. E. Bedford, assistant chief draftsman, Division VI, recently attained the degree of D. A. D. when a daughter arrived at his home in Fresno.

W. B. Reed, maintenance foreman at Coalinga, has resigned.

R. L. Beuthel, Division VI office engineer, motored as far north as Vancouver, British Columbia, during his recent vacation.

Sails for Europe.

J. F. Elwood, Division VII draftsman, sailed recently for an extended visit through England and France. He is expected to know all about European roads when he gets back.

Arnold Richardson, assistant resident engineer, has resigned to accept a position with the Los Angeles city engineering department.

George Mack, formerly with Division II, is now assistant resident engineer at Capistrano, Division VII.

L. R. McNeeley, assistant resident engineer, has been assigned to the Whittier boulevard paving contract.

J. B. Hodges has completed his work as resident engineer on the Anaheim Bay bridge and has been assigned to the McCray grading contract between Corona Del Mar and Laguna Beach, on the coast boulevard, Orange County.

R. L. Young and H. S. Payson, of Division VIII, have been loaned to Division VII, to supervise the laying of asphaltic concrete surfacing on the Whittier boulevard contract.

A. D. Griffin, resident engineer on the Hauser contract in Ventura County, is the proud daddy of a son.

SMILEWAYS

The Least She Could Do.

Nurse—"So you're the young lady who was with him when the automobile turned over?"

She—"Yes, I thought the least I could do was to give him that kiss he was trying to get."

Grade crossings seem to be abolishing people faster than the people are abolishing grade crossings.

"What's a zebra, father?" "A sport model jackass, my son."—*Farm Life.*

A Current Joke.

A chap was arrested for assault and battery and brought before the judge.

Judge to prisoner: "What is your name, your occupation and what are you charged with?"

Prisoner: "My name is Sparks, I am an electrician and I am charged with battery."

Judge (after recovering his equilibrium): "Officer, put this guy in a dry cell."—*Georgia Highways.*

Put It Over.

We may
Look it over,
Think it over,
Read it over,
Talk it over,
But we shall be judged entirely by our ability to put it over.

Reason to Scratch.

Captain—"Sam, why do you scratch your head so hard?"

Sam—"Why, I got dem rithmetic bugs in this man's army."

Captain—"They're called cooties, why do you call them arithmetic bugs?"

Sam—"Well, sir, dey add to my discomfort, subtract from my pleasures, divide my attention and multiply like the dickens."

A congressman once declared in an address to the house:

"As Daniel Webster says in his great dictionary—"

"It was Noah who wrote the dictionary," whispered a colleague, who sat close by.

"Noah, nothing," replied the speaker. "Noah built the ark."

How Much a Yard?

Mrs. B was almost speechless as she beheld the Grand Canyon.

"Isn't it wonderful?" she gasped.

"I'll say so," responded Mr. B, the well-known contractor.

"Boy, oh boy, that was some excavating job!"

Even our most law-abiding citizens believe in second-story work when it comes to pavements.—*Motor Land.*

Must Have Been Los Angeles.

Irate Wife—"John, you've kept dinner waiting."

Meek Husband—"Yes, dear, but I had to walk to where my car was parked tonight, there wasn't a taxi in sight."

Don't envy the traveler. The home billboards are equal to those he sees.

And No Damages.

Mr. Peck—"What a wonderful view!"

Mrs. Peck—"You keep your eyes on the road, Henry! You can get that view on a post card for five cents."—*Judge.*

He Knew.

At a lecture, the speaker orated fervently: "He drove straight to his goal. He looked neither to the right nor to the left, but pressed forward, moved by a definite purpose. Neither friend nor foe could delay him, nor turn him from his course. All who crossed his path did so at their own peril. What would you call such a man?"

"A truck driver!" shouted a voice from the audience.

C. F. Heintze, formerly assistant division engineer in Division III, and now a contractor on state work, shows that he has a proper sense of humor when he tells this story on himself.

It seems that two state inspectors reported on the job of concrete paving he was about to start.

"Hello George, Hello Leslie," said Heintze. "I remember you when we worked in Division III together. By the way I always treated you pretty well didn't I?"

Silence reigned for a moment and then Leslie spoke up, "Well, I don't know about that—my memory of you sitting behind your desk was that you were thinking 'Shall I keep him or fire him?'"

HIGHWAY NEWS NOTES

Sad Death in Division VIII.

A. Achtert, 53, assistant resident engineer in the employ of the California Highway Commission for a number of years, died recently while on duty on the Sand Hills-Yuma grading contract in the Imperial Valley, Division VIII. He is survived by a widow and three children residing in Napa. He was well liked in the division and was always faithful in the performance of his duties.

Division Engineer E. Q. Sullivan announces that W. D. Darling has been promoted to general maintenance foreman for those sections of the highway north and west of Whitewater River, Riverside County. E. M. Maurer has been promoted to a similar position for the territory south and east of Whitewater. Darling was formerly street superintendent for the city of Riverside.

Other changes in maintenance foremen in Division VIII are announced as follows:

W. L. Tatspaugh transferred from Amboy to Waterman Canyon; C. W. Hunt transferred from Newberry Springs to Fawnskin; S. Billger from Goffs to Newberry; and Geothe Diaselliss appointed maintenance foreman at Amboy.

Miss Della Bittke, assistant cashier, has returned from a visit to her former home in Chicago.

W. D. Cook has been transferred from the Sacramento headquarters to Division VIII where he will be in charge of the new division shops and equipment.

Somner With Committee.

Division Engineer F. G. Somner accompanied the Committee of Nine on its recent tour through Division IX.

Division X Items.

W. K. Wright, assistant division engineer, Division X, took a forced leave of absence recently when his residence was quarantined due to the illness of Mrs. Wright. She is reported recovering.

George Ullom, assistant resident engineer on the Sacramento-McConnell paving contract, is now with Resident Engineer H. O. Ragan at Vacaville.

J. W. Cole, field draftsman with the Jackson-Pine Grove location party, also has been transferred to the Vacaville widening and thickening job.

Joe Farrell has been transferred from the Sacramento to McConnell contract to assist resident engineer C. O. Dingle on the Tracy widening and thickening contract.

Milliken in South.

Ben H. Milliken, superintendent of prison road camps, spent several days recently in southern California studying methods employed by Los Angeles County in the use of county prisoners in road construction work in the San Gabriel Mountains. The trip gave him opportunity to accept a number of invitations to address luncheon clubs and other organizations in the south on the use of convict labor by the California Highway Commission.

Fred Seymour, assistant to Ben Milliken, returned recently from a vacation enjoyed in San Diego.

CONSTRUCTION ACTIVITIES IN CALIFORNIA NATIONAL FORESTS

THE PICTURES—1, typical forest service bridge across small stream; 2, trail in the Angeles Forest; 3, a road in the Plumas Forest; 4 and 6, bridges spanning the Klamath River; 5 and 8, on the Mount Wilson Trail; 7, construction scene in the California Forest; 9, a view on the Yuba Pass highway; 10, a forest road near Echo Lake, in the El Dorado Forest.

Seattle Public Library

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FRANK J. SMITH, Superintendent
SACRAMENTO, 1924

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CALIFORNIA HIGHWAYS

OFFICIAL PUBLICATION OF THE CALIFORNIA HIGHWAY COMMISSION

Vol. 1 OCTOBER, 1924 No. 10

BEFORE AND AFTER AT POINT MUGU—For centuries old Point Mugu, promontory on the southern coast, has battled against the ceaseless surging of the mighty Pacific, but the road builders of the California Highway Commission have changed his physiognomy forever. Countless motorists, who soon will be passing his way, will hardly recognize the rocky point of former years.—See story on page 5.

CONVENTION EDITION—AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS

In this issue: WIDENING THE PACIFIC HIGHWAY—BUILDING A NEW PLANK ROAD ACROSS THE SAND DUNES—THE SPECTACULAR HAUSER CONTRACT—EVOLUTION OF THE HIGHWAY OF THE MISSIONS—A MODERN MOUNTAIN GRADE.

C 27

California Highway Department

California Highway Commission

HARVEY M. TOY, Chairman, San Francisco

N. T. EDWARDS, Commissioner, Orange — LOUIS EVERDING, Commissioner, Arcata

R. M. MORTON, State Highway Engineer, Sacramento

PAUL F. FRATESSA, Attorney, San Francisco — W. F. MIXON, Secretary, Woodland

---

Headquarters Staff, Sacramento

T. E. STANTON, Assistant State Highway Engineer

FRED J. GRUMM, Office Engineer in Charge of Surveys and Plans

C. S. POPE, Construction Engineer

HARLAN D. MILLER, Acting Bridge Engineer

R. H. STALNAKER, Equipment Engineer

G. R. WINSLOW, Maintenance Engineer

LOWELL R. SMITH, Purchasing Agent

HERMAN B. WEAVER, Chief Accountant

Division Engineers and Headquarters

T. A. BEDFORD, Division I, Willits

H. S. COMLY, Division II, Dunsmuir

F. W. HASELWOOD (Acting), Division III, Sacramento

J. H. SKEGGS, Division IV, San Francisco

L. H. GIBSON, Division V, San Luis Obispo

J. B. WOODSON, Division VI, Fresno

S. V. CORTELYOU, Division VII, Los Angeles

E. Q. SULLIVAN (Acting), Division VIII, San Bernardino

F. G. SOMNER, Division IX, Bishop

J. C. McLEOD, Division X, Sacramento

General Headquarters, Fifth Floor, Forum Building, Sacramento

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OCTOBER 1924

California Highways

VOL. 1 No. 10

CALIFORNIA TO ENTERTAIN HIGHWAY OFFICIALS OF THE NATION NOVEMBER 17th TO 20th

SAN FRANCISCO READY FOR ANNUAL CONVENTION OF AMERICAN ASSOCIATION

GREETINGS, Road Builders of a Nation!

The California highway department extends hearty welcome to the tenth annual meeting of the American Association of State Highway Officials. It is our hope and expectation that every state will be represented when the convention opens in San Francisco, November 17th.

The west is proud of the progress it has made in highway construction in recent years, and is glad of the opportunity which the convention affords for a review of western accomplishments by those charged with similar duties in other states.

California engineers, in particular, expect to gain much from your presence and the discussions of the convention, and it is their hope that your visit will not be without benefit to you.

While you are with us, the California highway department is at your service. All we ask, is that you let us help make your stay pleasant and profitable.

PLANS have been completed for the tenth annual convention of the American Association of State Highway Officials which convenes in San Francisco November 17th, for four days. General sessions will be held in the Italian Room, St. Francis Hotel, and committee meetings at the Hotel Manx.

California will be represented by members of the commission, State Highway Engineer R. M. Morton, and engineers from headquarters and the divisions. A goodly attendance from throughout the country is indicated from the responses to the printed program mailed to all state highway departments and officials of the Bureau of Public Roads.

Motor Trip Planned.

It is suggested that visiting officials and delegates come to California over the northern routes and leave the state via Los Angeles. This will give opportunity for a motor trip from San Francisco to Los Angeles following the convention. Sufficient automobiles to transport the entire convention over state highways between the two cities will be available. The trip will be complimentary.

Sightseeing trips, including a visit to San Francisco's famous Chinatown and special entertainment for visiting ladies, have been arranged for the four days of the meeting. The Down Town Association of San Francisco will tender the association a complimentary luncheon on the closing day.

The Program.

The program for the four days is as follows:

MONDAY, NOVEMBER 17th

Morning

President Fred R. White, Iowa, Presiding.

8:30 to 10:00—Registration of Delegates.

10:30—Prayer, by Rev. James L. Gordon, First Congregational Church.

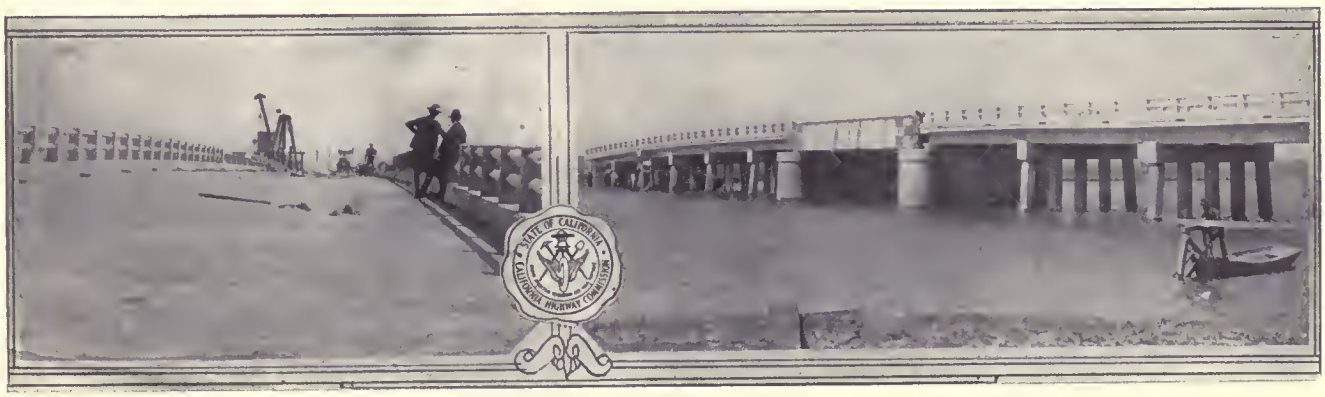
Address of Welcome to California, by Governor Friend Wm. Richardson.

Address of Welcome to San Francisco, by Mayor James Rolph, Jr.

Response and President's Annual Address—Fred R. White, Chief Engineer, Iowa.

Annual Report—W. C. Markham, Executive Secretary.

(Continued on next page.)



ANAHEIM BAY BRIDGE—New state highway structure recently completed by Orange County across an arm of Anaheim Bay on the Coast boulevard, in that county. Plans and specifications and inspection were provided by the bridge department of the California Highway Commission. There is a removable steel span in the center. The bridge deck was finished by methods similar to those employed on concrete pavements, which included the longitudinal float as part of the equipment. It offers a smooth and uniform surface true to grade. J. B. Hodges was resident engineer.

"Some Interesting Features in the Construction of the 'Wendover Cutoff' in Utah," by Howard C. Means, Chief Engineer, Utah. (Illustrated)

12:30—*Executive Committee will meet at luncheon.*

Afternoon

1:30—Meeting of standing committees at Hotel Manx.

8:00—Entertainment—Evening open for delegates and families to attend theatres, sightseeing, etc.

TUESDAY, NOVEMBER 18th

Morning

H. G. Shirley, Virginia, Presiding

9:00 to 11:00—Standing committees continue the work of Monday afternoon.

HIGHWAY OPERATIONS

11:00—*"How Shall Interstate Highways be Named and Marked?" by A. H. Hinkle, Superintendent of Maintenance, Indiana.*

Discussion, by W. G. Sloan, New Jersey.

"Urgent Need for Uniform Traffic Laws and Public Safety Devices Throughout the United States," by Thomas H. MacDonald, Chief, Bureau of Public Roads.

General discussion.

Afternoon

L. A. Boulay, Ohio, Presiding

ADMINISTRATION

2:00—*"To What Extent May a State Economically Issue Bonds for Road Construction?" by Frank T. Sheets, Chief Highway Engineer, Illinois.*

Discussion, by Frank Page, North Carolina.

"Highway Transportation Surveys," by J. Gordon McKay, Chief, Division Highway Transport and Economics, Bureau of Public Roads.

Discussion, by Wm. H. Connell, Pennsylvania.

DESIGN

"Problems of Mountain Road Construction," by James Allen, State Highway Engineer, Washington.

Discussion, by L. I. Hewes, Bureau of Public Roads.

"Some of the Recent Conclusions in Highway Research," by A. T. Goldbeck, Chief, Division of Tests, Bureau of Public Roads.

Discussion, by Chas. M. Upham, North Carolina.

8:00—Trip through San Francisco's famous "Chinatown."

WEDNESDAY, NOVEMBER 19th

Morning

H. B. Phiips, Florida, Presiding

9:00—*"The Value of the Practice of Weighing Concrete Aggregate for Pavement Construction," by R. W. Crum, Engineer, Materials and Tests, Iowa.*

Discussion, by F. C. Lang, Minnesota.

"Needed State and National Highway Legislation for the Public Land States," by Harvey M. Toy, Chairman State Highway Commission, California.

Discussion, by Cyrus S. Avery, Oklahoma.

"Convict Labor in Highway Construction," by R. M. Morton, State Highway Engineer, California.

Discussion, by O. T. Reedy, Colorado.

Afternoon

Frank F. Rogers, Michigan, Presiding

2:00—Presentation of reports of standing committees:

Standards—E. W. James, Bureau of Public Roads, Acting Chairman.

Plans and Surveys—E. W. James, Bureau of Public Roads, Chairman.

Design—H. E. Hilts, Pennsylvania, Chairman.

Specifications—Chas. M. Upham, North Carolina, Chairman.

Construction—J. H. Mullen, Minnesota, Chairman.

Bridges and Structures—E. F. Kelley, Bureau of Public Roads, Chairman.

Tests and Investigations—H. S. Mattimore, Pennsylvania, Chairman.

Non-Bituminous Testing Problems—H. F. Clemmer, Illinois, Chairman.

Bituminous and Chemical Testing Problems—Henry M. Milburn, Bureau of Public Roads, Chairman.

Maintenance—J. T. Donaghey, Wisconsin, Chairman.

8:00—Banquet, Colonial Ballroom, St. Francis Hotel.

THURSDAY, NOVEMBER 20th

Morning

Fred R. White, Iowa, Presiding

9:00—Reports of standing committees—Continued:

Administration—Chas. M. Babcock, Minnesota, Chairman.

Traffic Control and Safety—A. H. Hinkle, Indiana, Chairman.

Publications—Fred R. White, Iowa, Chairman.

Highway Transport — Thomas H. MacDonald, Bureau of Public Roads, Chairman.

Co-operation with Contractors—W. R. Neel, Georgia, Chairman.

Regular Business Session.

Noon—Luncheon given to delegates by "Down Town Association" of San Francisco, in Colonial Ballroom, St. Francis Hotel.

The entertainment committee is composed of the following: Harvey M. Toy, California Highway Commission, Chairman; R. M. Morton, state highway engineer, California; R. A. Klein, Oregon; H. C. Means, Utah; and James Allen, Washington.

L. D. Blauvelt, of Colorado, is chairman of the program committee.

BUILDING THE HIGHWAY AROUND POINT MUGU

PROBABLY the most dangerous and difficult single piece of construction work on the California state highway system was the 3800 feet of grading around Point Mugu, twelve miles southeast of Oxnard, Ventura County, in Division VII. The section is a part of the Oxnard-San Juan Capistrano coast boulevard authorized by the bond issue of 1919.

The work was done by state forces under the direction of Superintendent M. L. Sullivan. A force averaging about sixty men moved 108,000 cubic yards of rock at an expenditure of approximately $108,500. As the material moved was mostly hard rock and the size of the job did not warrant the bringing in of heavy excavation machinery, this was considered a good showing.

The heaviest cutting was through the main ridge of Point Mugu, a remnant of igneous dyke with almost vertical sides jutting out into the deep ocean, with a raging surf on three sides. Where pierced by the roadway, this ledge was 150 feet thick. The cut to grade varied from 40 feet on the ocean side to 115 feet on the high side, and necessitated the movement of 23,000 yards of hard rock.

How the Work Was Done.

Blasting was done by "benching down" methods. A series of drill holes staggered over the top of the cut, about 20 feet apart, were drilled 25 to 30 feet deep. These were sprung to get an explosive chamber at the bottom, and loaded with black powder or dynamite, a dozen or more of the holes being fired at one time. The debris was then cleared away and the whole operation repeated until the cut was down to grade.

Work progressed slowly at first. Workmen on the high cliffs were compelled to use ropes to keep a foothold. Merely getting up and down to and from work meant something of an adventure, and the handling of thirty-foot drill steel in the frequent high winds presented a grave danger.

Getting the first benches started on the cliff tops was the big problem; after that the rest of the job became a matter of routine, coupled with perseverance and the judicious use of 18 tons of 60 per cent hand grenade powder from war stock and 25 tons of black blasting powder. The total explosives used averaged 0.83 pounds per cubic yard moved.

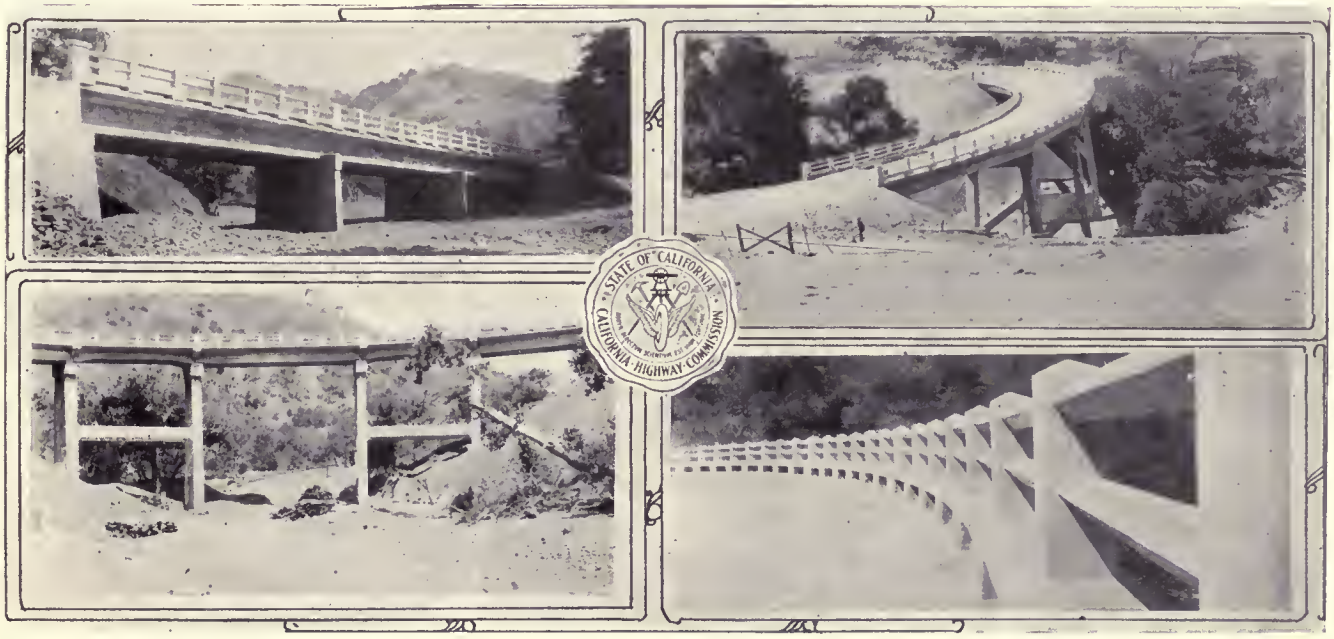
Must Conquer the Old Pacific.

Some slides have occurred during the twenty months in which this completed section has been subject to the action of the elements. However, the total slide yardage so far removed amounts to less than 5 per cent of the original yardage moved during construction. In spite of the thousands of tons of rock which have been fed to it, there are a few places where embankment slopes are being nibbled away by the ocean. This is the chief concern now. The pounding surf is, however, gradually keying the rocks together and flattening the toe slopes, and before long a state of equilibrium should be established.

Nevertheless, along this piece of rugged coast line the Old Pacific is recognized as an arch enemy to whom we must trust as little as possible of our costly highway. (See views on front cover.)

A colored man, recent arrival at a prison camp, was assigned to the powder gang, as a driller, making "gopher-holes" to blow out the side of the bluff of solid rock. He replied to the foreman:

"If it's just the same to you, sah, I'd like to do some other work besides moving mountains, for I've got religion, and God put those mountains there for some purpose, and I do not wish to have a hand in spoiling His work!"



NEW PACHECO PASS BRIDGES—Upper left, new reinforced concrete bridge across Cedar Creek on the Pacheco Pass route, Santa Clara County; upper right and below, new structure across the south fork of Pacheco Creek on the same route. This bridge has a superelevation of two feet and is built on a 170-foot radius curve; length 218 feet. Note detail of guard rail and concrete tower and girder design. The county participated in the cost of the work.

WIDENING AND STRAIGHTENING PACIFIC HIGHWAY

By H. S. Comly, Division Engineer, Dunsmuir.

WITH considerably more than 300,000 cubic yards of earth and rock already moved, the initial contract for the widening and realignment of the state highway between a point twelve miles north of Redding and Dunsmuir is rapidly nearing completion. The revised estimate shows 370,000 yards of material to be handled but it is probable this figure will be increased by slides, overbreak and daylighting before the work is finished.

Execution of this contract has progressed remarkably fast despite the fact that the traffic over this section of the highway is estimated at 100,000 motor vehicles since March 6, 1924, when the first power shovel began operations. The date for completion of the work, as fixed in the contract, is February 5, 1924, but the Nevada Contracting Company, the contractors, will have finished long before that time.

More than a month ago the progress chart showed the contractor 89,000 cubic yards ahead of the schedule. Prior to June 15th, the road was closed for sixteen hours a day and the yardage moved averaged 14,500 cubic yards. Since that time the road has been open fifteen hours and the weekly average has dropped to 10,800 yards. The monthly average has been 57,000 cubic yards.

Traffic counts show an average of 250 cars per day in February. This increased to 1000 vehicles a day in July.

Two steam shovels and three gas shovels have been used on this job, operating largely at night and during the daytime only at such location as would not seriously interfere with traffic. Despite the large number of machines handled over the construction, no serious accidents have occurred.

Realignment Big Feature.

Important features of this work are the widening and realignment of the roadway. These matters were given thorough study in the preparation of the plans, and changes that have been made are readily recognized by those who have had occasion to travel this section of the highway during recent weeks. The total length of the project now under construction is 9.9 miles and the saving in distance over the old road amounts to 0.6 of a mile or a 5.7 per cent reduction in length.

Many problems, in addition to handling traffic, were encountered as the work progressed. Not the least of these was the necessity for protecting buildings and other private property along the right of way. At the south end of the Pit River bridge, the plans called for a fifty-foot cut to improve the approach. An enterprising business man had perched a service station and lunch room at the edge of the highway just above the river. The 5400 cubic yards to be moved ordinarily would have been shot over the bank into the river. It was all waste and in a solid rock ledge formation. The work was carried forward to within 100 feet of the building in the usual manner, then the charges were made smaller and smaller until the quantities displaced became as small as thirty or forty yards, the rock being shot down in benches and gorged out with a steam shovel.

The shovel was placed between the rock wall and the building to protect it from the blasts. The work progressed to the last shot with only a stray fragment now and then falling on the roof of the building. The last shot broke two windows and the hearts of the men in charge.

In view of the fact that it was at first considered an impossibility to remove the wall of rock without serious damage to the building, the result is considered quite an accomplishment by those connected with the work.

Engineers Eliminate Curves.

The engineers, too, had their troubles. On one section, known locally as the Devil's Pocket, the old highway crossed a stream on a sharp curve and zigzagged up the hillside. There were thirty-two curves in the unit under discussion, nineteen of which were of 100-foot radius or less. The total length was 6800 feet with 2624 feet of curvature.

The new alignment, after extensive study, involving two preliminary lines in the field and several paper locations in the office, was finally placed with only seven curves, one of which has a radius of 200 feet and the others over 300 feet, with a total length of curvature of 3500 feet and a total length of 5900 feet, a saving of 900 feet in distance. Heavy grading was necessary to achieve this result, but it is justified.

Special attention has been given to drainage. To eliminate the necessity of replacing corrugated pipe at some future date after paving has been completed, drainage pipes are being encased in class "C" concrete. A saving is being effected by removing and using much of the old pipe now in place.

This ten-mile unit, from Bayha to Half Way Creek, when completed, will have a roadbed section of twenty-six feet as a minimum in cuts and twenty-eight feet on fills with ditches in addition in the cuts. A twenty-foot crushed rock wearing surface is being placed. Where the new construction joins the former roadway, there are many extremely wide places. The result will be numerous safety parking spaces throughout the canyon.

More Plans Ready.

The estimated cost of the grading and surfacing of the 9.9-mile unit is $553,573.46. It is classed as a reconstruction job and is being financed from the gasoline tax fund.

Plans are being completed for similar work on the remaining sections between Redding and Dunsmuir, not yet widened and straightened. It is hoped contracts may be let at an early date as this work must be done before paving can be considered.

(See views on next page.)

TEHAMA BRIDGES COMPLETED

Six reinforced concrete bridges on the Eastside highway between Los Molinos and Red Bluff, in Tehama County, have been completed and opened to traffic, it is announced by the bridge department. These handsome structures add materially to the convenience and safety of travel up the Eastside and will be appreciated by the public.

Obsolete county structures were replaced at a cost of approximately $46,000, the contract being financed from the 1915 bond fund.

STRAIGHTENING THE PACIFIC HIGHWAY—Upper left, old grade cleared for new work; upper right, cut and fill eliminating sharp curve, dotted line being center line of former grade; lower left, grade and line change, old grade at right; lower right, elimination of curves by cuts and fills, dotted line showing former location.

BRUSH CLEARED FROM HIGHWAYS AIDS FIRE PREVENTION IN SOUTH

AS ITS part in the campaign against forest fires in southern California, Division VII expended $3,400 during the spring and summer in clearing brush and weeds from the state highway right of way in Los Angeles County.

Maintenance crews on the Ridge Route, working at such times as their regular duties permitted, cleared brush and dry matter from many miles of the highway.

Similar work was done in Mint Canyon and along the Foothill boulevard between Sunland and Claremont. The result has been that not a single fire was traced to the state highway right of way, according to reports of the maintenance department.

In Division V, four men from the crew of Contractor George Pollock assisted in fighting the fire at Tassajero Hot Springs. This is the only instance in which the Division was called upon for assistance under the agreement between the commission and the United States Forest Service.

Maintenance forces in Humboldt and Mendocino counties were called upon on thirteen different days during June, July and August to assist in combating fires in that district, Division I reports.

Many Fires in North.

Division II reports more fires in that section during the past summer than ever before. There were fires in all of the six national forests in the division. Division engineer H. S. Comly estimates that highway forces in his division were called upon 150 times during the summer and that 500 men, state employees and contractors' crews, were engaged at various times in fighting fire. On several occasions the division furnished the forest service with trucks and tools.

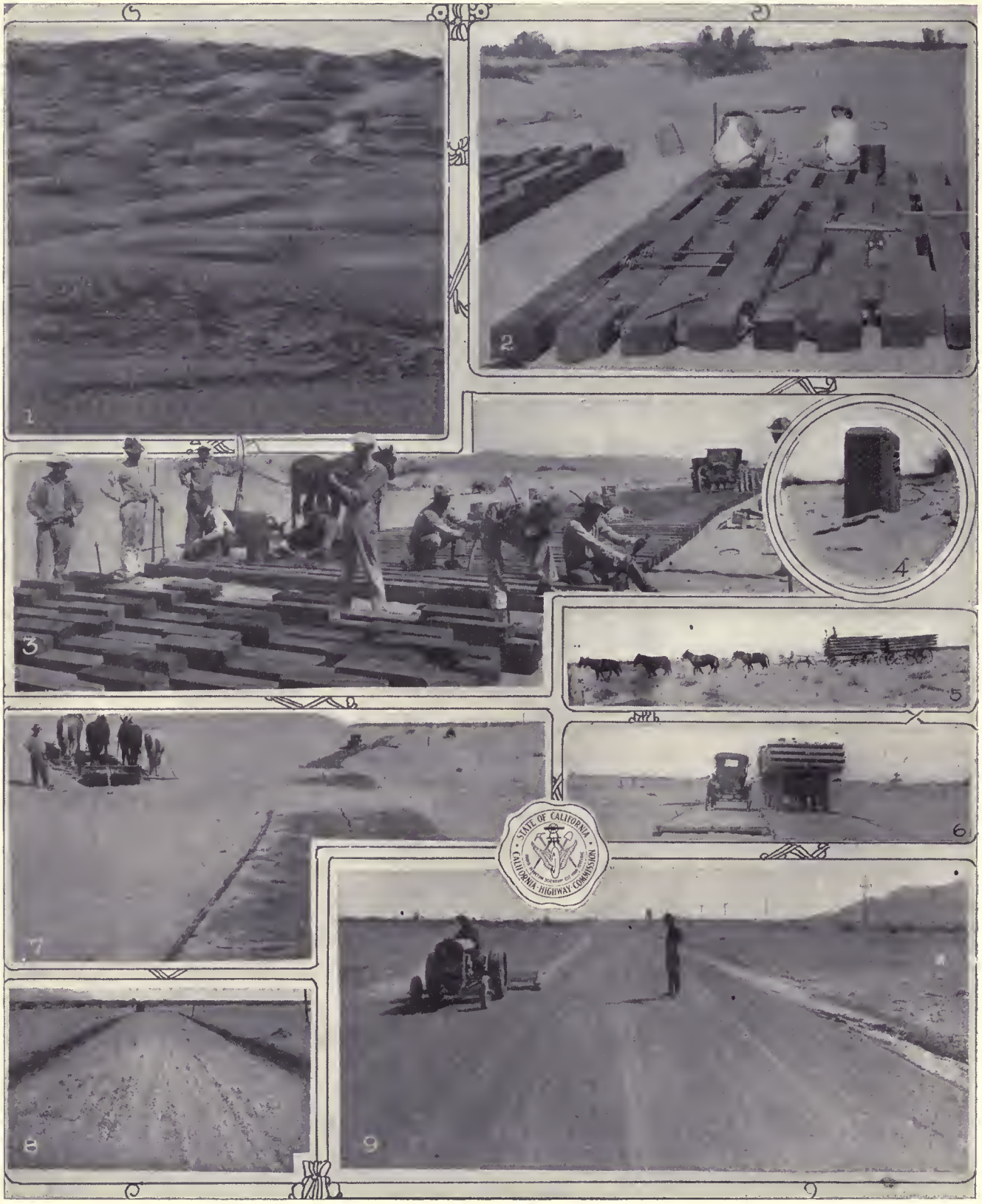
Camps at Walker, on the Klamath River, and at Mineral, in Tehama County, and contractors' crews in the Sacramento canyon were called upon most frequently to assist in fighting forest fires.

REPORTS ON FOREST ROAD

A considerable portion of the forest road project between Murphys and the Big Trees, Calaveras County, is completed, according to a report to Division Engineer J. C. McLeod from R. E. Pierce, assistant division engineer. The Bureau of Public Roads has charge for the United States Forest Service.

Following a recent inspection of the work, Pierce said the minimum width through cuts was fourteen feet with two feet on each side for ditches, making eighteen feet in all. Fills have a minimum width of twenty feet. On sidehill work the road is generally wider than the minimum width.

Alignment and grades were declared very good.



BUILDING THE PLANK ROAD ACROSS THE SAND DUNES—Views on the California state highway in southern Imperial County, near the Mexican border, the trunk line to Yuma. (1) View of the shifting dunes, enemy of road builders; (2) completing a section of the new plank road of redwood timbers; note methods of bolting timbers together; (3) another view of the new plank road, eighteen feet wide; (4) right of way marker in the desert, showing results of sand storms; (5) and (6) constructing the first plank road, built in 1916; (7) the present eight-foot plank road; maintenance man at work removing sand drifts; (8) new highway grade across the desert east of the Sand Hills before rolling, shoulders oiled to prevent drifting of sand; (9) the finished gravel highway looking toward Yuma. Pilot Knob, on the international boundary, at the right. (See article on next page.)

NEW PLANK ROAD IS UNDER WAY ACROSS SAND DUNES

PROBABLY no state in the Union faces such a range of difficult problems in the construction and maintenance of a system of highways as California.

Just now, divisions with trans-Sierra roads are getting ready to abandon them to the annual blockade of snow. In another section, equipment is being made ready for emergencies in order that the Pacific highway may be kept open throughout the winter. While this is going on in the north, engineers down on the southern desert, where it is still summer as far as temperature is concerned, are building a section of new plank road across shifting sands as treacherous as those of the Sahara.

The famous Sand Hills of Imperial County extend northward from the Mexican border sixty miles. At the place where they are crossed by the state highway, the dunes are six and one-half miles wide. The only way to provide an outlet over the southern route to the east within United States territory is to bridge this barrier. No permanent solution of the problem has yet been found.

Commissioner Suggests Redwood.

The present plank road, built of pine lumber in 1916, is rapidly deteriorating and must be replaced. A plan for an entirely new roadway, to be constructed of redwood timbers, was suggested to the engineering department by State Highway Commissioner Louis Everding of Arcata, a lumberman of many years' experience. The commissioner's design, with some modifications, is now being followed in the construction of 2000 feet of experimental road.

Half of the test unit is eighteen feet wide and the other 1000 feet is ten feet wide. The new roadway is described as consisting of 6-inch by 8-inch plank, respectively 10 feet and 18 feet long, laid on the 8-inch side, and separated by spacers, 4 inches by 6 inches by 24 inches, so placed as to form a track and continuous path for vehicles. The planks are held together by bolts, the unique feature of the design being the arrangement of the bolts so as to hold the planks firmly together and yet permit sufficient elasticity to not unduly strain the structure by possible expansion and contraction during periods of extreme heat on the desert.

The 18-foot road is constructed in sections 6 feet long to facilitate maintenance when it becomes necessary to replace worn planks. These sections are fastened together by means of hooks and eyes so that any section may be removed and replaced independent of the balance of the road.

Road Built in Sections.

The 10-foot road is built in sections 8 feet long. In deciding upon the length of the sections, consideration had to be given to their weight and unwieldiness. After storms, a truck with a crane can elevate sections of the roadway, the sand can be sifted through the openings between the timbers, and the track lowered again to its proper place.

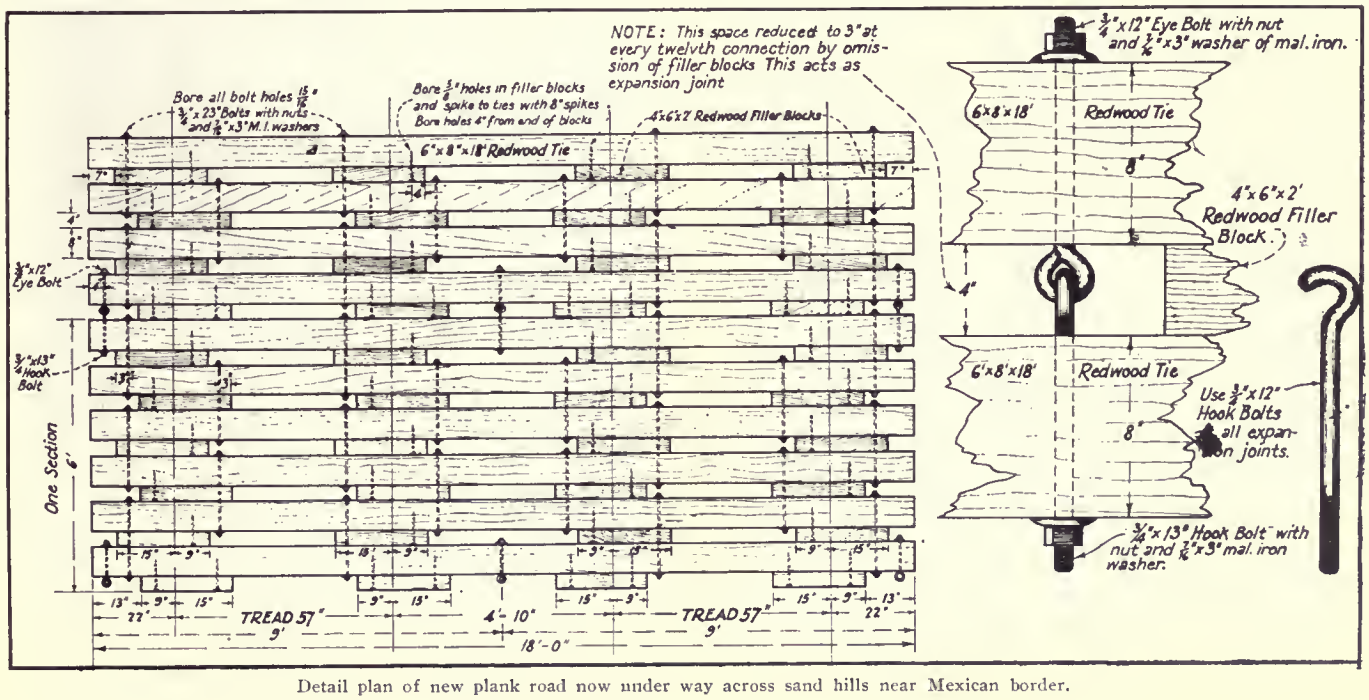
The present road is but eight feet wide. It consists of planks bolted and spiked to stringers and held in place by three bands of strap iron. There are no openings between the planks and sand drifts have to be removed with scrapers. The timbers are weakened from dry rot in many places and constant maintenance is necessary.

Redwood, with its vastly superior lasting qualities, is believed the solution unless some means other than a plank road is found for crossing the dunes.

New Unit Nears Completion.

East of the Sand Hills, the highway commission is completing a graded and rock surfaced highway to the Arizona line at the Colorado River, opposite Yuma. This road will

(Continued on page 15, column 1.)


NOTE: This space reduced to 3" at every twelvth connection by omission of filler blocks This acts as expansion joint
Bore all bolt holes 15/16" 3/4"x23" Bolts with nuts and 3/16"x3" M.I. washers
Bore 3/4" holes in filler blocks and spike to ties with 8" spikes Bore holes 4" from end of blocks
4"x6"x2' Redwood Filler Blocks
6"x8"x18' Redwood Tie
3/4"x12" Eye Bolt
3/4"x13" Hook Bolt
One Section
TREAD 57"
4'-10"
TREAD 57"
18'-0"
3/4"x12" Eye Bolt with nut and 3/16"x3" washer of mal. iron.
6"x8"x18' Redwood Tie
4"x6"x2' Redwood Filler Block
6"x8"x18' Redwood Tie
Use 3/4"x12" Hook Bolts at all expansion joints.
3/4"x13" Hook Bolt with nut and 3/16"x3" mal. iron washer.

Detail plan of new plank road now under way across sand hills near Mexican border.

THE SPECTACULAR HAUSER CONTRACT

By A. D. Griffin, Resident Engineer.

ONE of the largest and most spectacular grading contracts ever awarded by the California Highway Commission is that for the construction of a section of the Oxnard-San Juan Capistrano highway along the Ventura coast, in Division VII, now well known as the Hauser contract.

This undertaking, several months ago, passed the half way mark both as to time consumed and results accomplished. Its completion is now in sight.

With supplemental extensions and additional work orders, the contract now covers a distance of ten miles, and entails the movement of more than 1,000,000 cubic yards of excavation. About 75 per cent of this is unusually heavy work to be attempted in highway construction. In one section of 3500 feet, where safety from the incessant action of the ocean waves demands a roadbed benched in solid rock, some 250,000 yards will be moved.

Many Difficulties Involved.

The Oxnard end of the contract is easily accessible over previously completed state work. The Santa Monica end may be reached from that city over seven miles of new state pavement and twenty-two miles of rough mountain road. Camp equipment and steam shovels for the south end had to be brought in by water on ocean scows. This was a dangerous and expensive undertaking, as tug-boat captains were loath to come in shore along this rocky coast unless amply protected and well paid. Landings, however, were made in a rather heavy sea without mishap.

Drilling and blasting operations present the main difficulties from a construction standpoint. Trails had to be built over the hills to the edge of the cliffs, and ropes and ladders provided to make the face of the cliffs accessible for "coyote" tunnel operations. After pipe lines were laid from the air compressors, tunnels were driven to the inside of the roadbed, usually at grade, and cross-cuts run at angles with large explosive chambers spaced about thirty feet apart.

Charges are proportioned according to the yardage to be moved, and the "lay" of the rock. As many as 250 cans (25 pounds each) of black powder have been placed in one pocket, and often a single blast comprises 3200 cans. After the explosive is placed, back-filling the tunnels is no small job, as frequently all the rock wheelbarrowed out in making the tunnel has been dumped into the ocean and carried away. Often new material has to be blasted near the tunnel portal, or lowered down in buckets from the top.

Blasting Requires Extreme Care.

In general, the roadbed section along the crucial stretches cuts through the igneous hard rock which forms the cliff faces, and intercepts the soft interior rock of sedimentary origin. This makes the blasting a delicate and uncertain matter, and it is not to be wondered that actual conditions are sometimes misjudged.

Only recently, the powder foreman, a man of years of experience, who has been on the job from the beginning, miscalculated how far back one of his large blasts would break. The top of the cliff, 150 feet above the explosive charge, broke about 60 feet back of the slope stakes, and carried away the ground on which the foreman and two helpers, who fired the shot, were standing. It is unbelievable that they could have gone down 200 feet to the very surf with all that mass of moving rock and live. Fortunately, all three escaped death.

In some of the larger cuts, blasting operations actually move out about half the yardage, thus making lighter the work of the steam shovels. The Hauser Company, the contractor, has one 2½-yard railroad steam shovel which works ahead over-casting. A one-yard Caterpillar shovel follows up with an industrial railroad outfit and finishes the grade. A third shovel, a 1½-yard Caterpillar, is at the Santa Monica end with a dump truck outfit and is building finished roadway as it comes. The contractors recently succeeded in bringing in a fourth shovel on an ocean scow which was beached along the coast. The shovel was moved to shore on its own power and is now in operation.

Engineers Have Troubles, Too.

Survey parties under C. G. Leland and L. G. Corey work ahead of the drillers and feel that the contractor has no corner on the hard work. Climbing perpendicular cliffs and dangling from ropes above the waves is all a part of the day's work. The resident engineer also has memories of jobs that did not require a long day of hard labor to make the rounds. However, the main thing is that the work is progressing smoothly, and the finished highway commencing to take form.

Some day, in the not distant future, California motorists will have another highway of wondrous scenic beauty to enjoy.

(See views on back cover.)

MOUNTAIN HIGHWAYS—At left, near Cedar Pass on the state higbway between Alturas and Surprise Valley, Modoc County; right, a recently completed section of the Susanville lateral near Mineral, Tehama County.

COUNTY COOPERATION SPEEDS HIGHWAY JOBS

THE urgent desire upon the part of counties for maintenance or completion of various units of the state highway system, often on lateral roads, has encouraged the state highway commission to enter into a considerable number of county cooperative projects during recent months. Despite its diminishing finances, the commission has considered it good business to get the work done where counties are willing to put up substantial sums for highway work.

One of the most notable cooperative projects is the widening of the Whittier boulevard, in Los Angeles County. A highway fifty-six feet wide and nine inches thick has been constructed, the county and property owners paying half the cost.

On the Bay Shore highway, in San Mateo County, the city of San Francisco is paying the entire cost of five miles of highway, the state supervising the work.

In Orange County, the state provided the plans and supervised the construction of a bridge on the state highway across an arm of Anaheim Bay. The county furnished the money.

Butte Aids Work.

In Butte County, the board of supervisors expended $7,000 for rights of way and contributed $15,000 to get 1.7 miles of the Chico-Orland lateral paved. The state is expending an equal amount.

Among other recent county cooperative projects are the following:

San Lorenzo Creek bridge, Monterey County, built by state, county and King City furnishing part of cost of bridge and approaches;

Bridges on Alturas lateral and on Susanville-Reno highway, in Lassen County, built by state, county to repay cost over a period of two years;

Maintenance on Cassel road, Shasta County contributing $5,000 toward cost of work;

Maintenance on Redwood highway, Del Norte County advancing $8,000 toward cost.

Bridges Constructed.

Cottonwood Creek bridge on Walker Pass highway, state furnishing plans and building structure, Kern County advancing funds;

Grading of 6.9 miles of Rio Vista lateral, Solano County to do rock surfacing;

Grading and surfacing of section of Tahoe-Ukiah highway west of Williams, Colusa County advancing $40,000 toward cost of work;

Cherokee Canal bridge, Butte County advancing $5,000 toward cost, work done by state;

Dry Creek bridge, state furnishing plans and supervision, Amador County letting contract; state to grade mile of highway;

Improvements on Alpine highway, Jackson citizens contributing $10,000 to help pay cost of work;

Pacheco Pass bridges, part of cost paid by Santa Clara County, plans furnished and work done by state;

Building of four miles of state highway east of Alturas, work done by state, funds furnished by Modoc County;

Van Duzen River bridge, plans furnished and construction supervised by state, Humboldt County contributing approximately half of cost;

Bridge across Chowchilla River, state to furnish plans and let contract, Madera County to advance $10,000 toward cost;

Bridge on Cholame lateral, $6,000 toward cost paid by San Luis Obispo County, plans furnished by state.

Forest Projects.

In addition to the above, the commission also is cooperating with the United States Forest Service in a number of projects within or adjacent to the forests.

AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS—WHAT IT IS AND ITS PURPOSE

THE American Association of State Highway Officials is a national organization composed of the state highway departments and highway officials of the various states and Hawaii. Dues paid by the departments themselves, as members, and by individual members, officials and engineers of the various departments, constitute the only source of revenue of the association.

In the words of F. R. White, of Iowa, president, the association is not interested in selling anything, in contracts, or in anything else except the building of a great system of highways for the benefit of the people of the country.

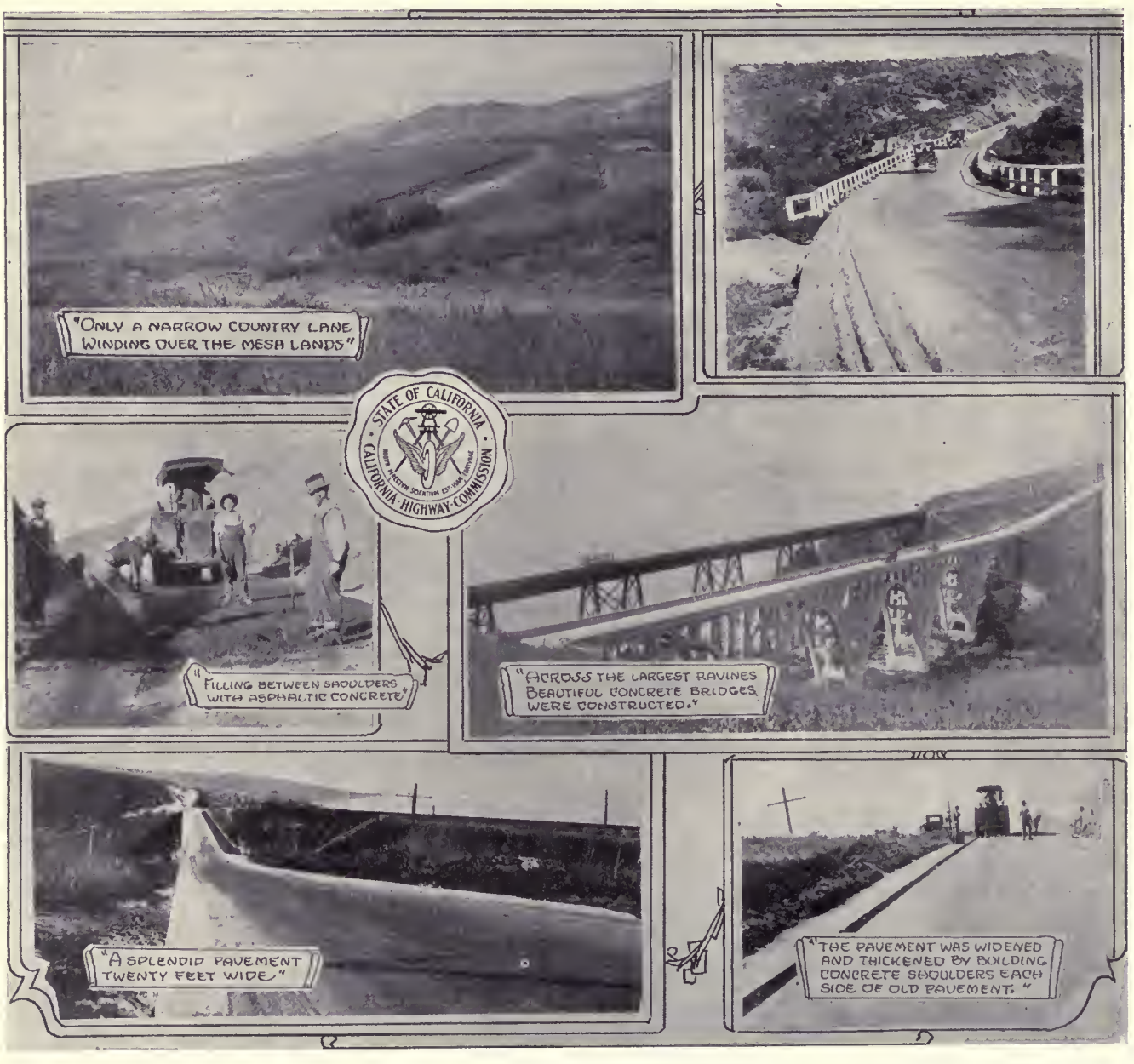
The association provides a means for the states to deal collectively with the national government in matters of federal aid; it also is a forum for the discussion of problems of engineering and administration. Through its officers, the association is constantly in touch with the Bureau of Public Roads, congressional committees and the progress of highway legislation. The convention to be held in San Francisco in November is its tenth annual meeting and the first to be held west of the Rockies.

Officers of the association are: F. R. White, Iowa, president; Frank F. Rogers, Michigan, vice president; Frank T. Sheets, Illinois, treasurer; Chas. M. Upham, North Carolina, secretary; W. C. Markham, Washington, D. C., executive secretary.

Executive Committee: C. M. Babcock, Minnesota; L. D. Blauvelt, Colorado; Wm. H. Connell, Pennsylvania; W. S. Keller, Alabama; Thomas H. MacDonald, Bureau of Public Roads; J. N. Mackall, Maryland; W. R. Neel, Georgia; P. D. Sargent, Maine; Z. E. Sevison, Wyoming; Harvey M. Toy, California.

California state highway near Bishop, Inyo County.

EVOLUTION OF THE HIGHWAY OF THE MISSIONS


"ONLY A NARROW COUNTRY LANE WINDING OVER THE MESA LANDS"
STATE OF CALIFORNIA
CALIFORNIA HIGHWAY COMMISSION
"FILLING BETWEEN SHOULDERS WITH ASPHALTIC CONCRETE"
"ACROSS THE LARGEST RAVINES BEAUTIFUL CONCRETE BRIDGES WERE CONSTRUCTED."
"A SPLENDID PAVEMENT TWENTY FEET WIDE"
"THE PAVEMENT WAS WIDENED AND THICKENED BY BUILDING CONCRETE SHOULDERS EACH SIDE OF OLD PAVEMENT."

By H. T. Avery, Office Engineer, Division V.

IF THE full story could be told of the transition of the present California state highway system from mere trails and winding roads to its present high standard of improvement, many an interesting chapter would be revealed. That portion of the Coast highway, north of the city of Santa Barbara, which follows the shores of Santa Barbara Channel for a distance of some twenty miles, has a picturesque setting and an interesting history.

The first trail along this route was blazed in the early days of the California Missions, by the famous Mission leader, Junipero Serra, and the padres who followed in his footsteps. Comparatively little is recorded concerning the transition of this route from a trail to a public road, but gradually such a change took place between 1780 and 1910, although, at the end of this period, the road was only a narrow country lane winding over the mesa lands and in and out of the sharp barrancas that cut their way to the sea.

With the advent of the California Highway Commission, the first step toward the improvement of this road was its relocation and the elimination of most of the twists and turns. The new line ran straight across many of the gullies and barrancas. Concrete culverts were built, and steam shovels cut away the banks and filled the bottoms, building a straight highway with easy rolling grades. Across the largest ravines, beautiful concrete bridges were constructed, in order to maintain, throughout, the same high standards of construction.

(Continued on next page.)

THE OLD ORDER CHANGETH

(From *Western Highways Builder.*)

RURAL communities are beginning to realize that routing through highways down main street brings many inconveniences as well as the dollars of tourists and some are casting a dubious eye on the once-sought-for main highway. Says the Palo Alto (Cal.) *Times*:

"There is satisfaction in knowing that the delegates at the highway conference held in Palo Alto were unanimous in the opinion that the proposed Bayshore highway should not be routed through the city of Palo Alto, but should be kept as far east as possible. As the recommendations of this group are to be made to the Committee of Nine appointed by the Governor, under authorization of the legislature, for the purpose of framing a highway policy with plans for its execution, we believe that we may safely count upon this point as to routing as being practically settled. The Committee of Nine has solicited the opinions of the localities affected by proposed highway systems, and therefore must be presumed to take them seriously when advanced.

The earlier plan of having the Bayshore highway connect with Middlefield road was highly objectionable. It would mean multiplied dangers to school children and others in a section where existing dangers from traffic are already too numerous. It would mean serious depreciation of property values for residences in the section affected. It would mean dividing the city by a thoroughfare with traffic as incessant as that now seen on the peninsula highway.

Keeping the Bayshore road out of the city proper will not only mean the prevention of these disagreeable conditions in Palo Alto, but will be a benefit to motorists who use the road, as their speed would not have to be cut down to urban limits when outside the urban zone."

HIGHWAY OF THE MISSIONS

(Continued from page 12.)

Grade Crossings Eliminated.

As the result of this type of relocation, the line was shortened by more than two miles in twenty miles. The curvature also was similarly improved, the total curvature in the first ten miles being reduced from 2668° to 383°; the grades reduced from 12 and 15 per cent to 6 and 7 per cent; the railroad grade crossings (four in number) were all eliminated; and a good highway of uniform width and standards substituted for the narrow, winding country road.

The graded highway was allowed to stand from 1915 to 1917 for the heavy fills to settle. During this period, it made a splendid road to travel in dry weather, but was difficult to negotiate when wet because of the prevailing adobe nature of the soil encountered.

In 1917, two contracts were let for the laying of a four-inch by fifteen-foot concrete pavement over this section. In spite of the ever increasing difficulties imposed by war time conditions, these contracts were carried to completion during the ensuing two years.

Pavement Widened and Thickened.

This light concrete pavement, placed directly on an adobe subgrade, with the roadway in cuts so narrow as to concentrate the drainage within a few feet of the pavement, soon began to show signs of failure under the traffic which quickly developed. In 1922, the pavement was widened and thickened by building concrete shoulders on each side of the old pavement, and filling between these shoulders with asphaltic concrete.

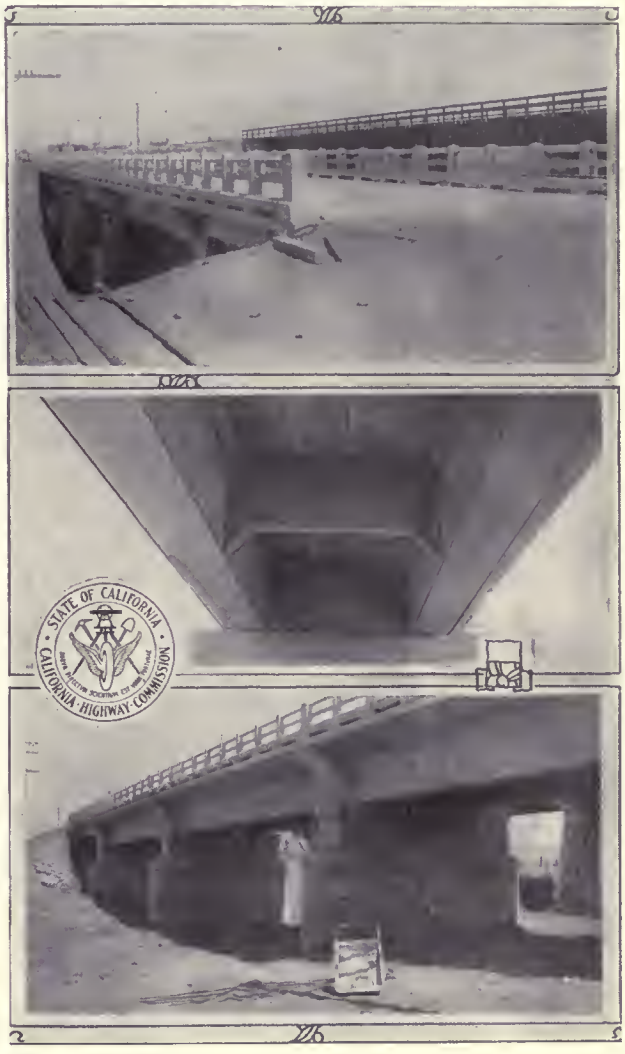
In order to better protect the subgrade from saturation, and at the same time to make the road safer to travel, work is now under way widening the graded roadbed to a minimum of 30 feet, and much wider on curves.

The result is that today the motorist travels this stretch of highway on a splendid pavement, twenty feet wide, with roadbed of ample width. The difficulties that beset his way in former days are removed and he now has opportunity to enjoy the vista of rugged hills and gently sloping fields that reach down to the placid blue waters of Santa Barbara Channel.

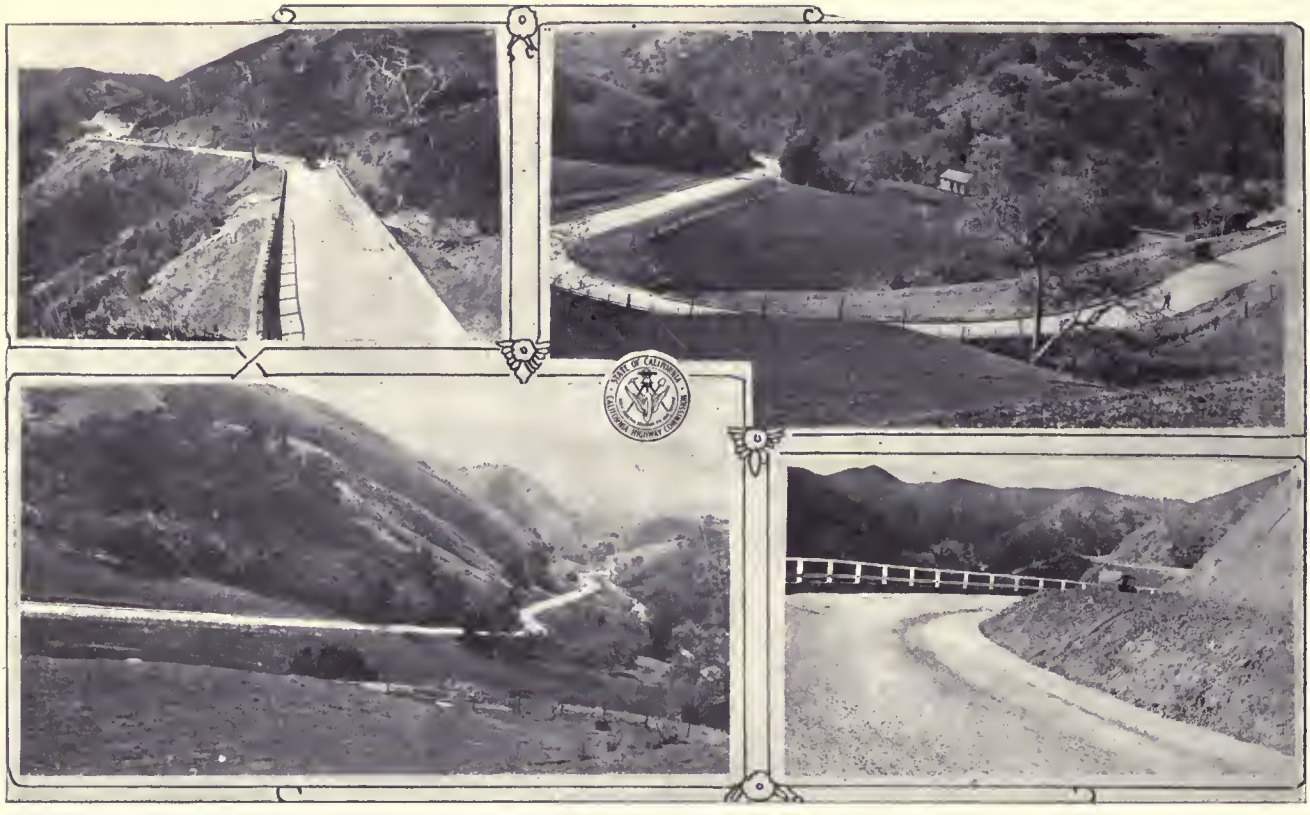
NEW BRIDGE DESIGN

The Bridge Department of the California Highway Commission is now designing and building two-girder bridges, as illustrated below. Harlan D. Miller, the bridge engineer, points out that this design lowers the amount of concrete in the superstructure and lessens the weight on abutments, making possible lighter foundations without loss of strength.

Experience indicates that bid prices will be lower.



SAN LORENZO CREEK BRIDGE—Views of the new structure recently completed on the coast route just south of King City, Monterey County. The two-girder design, here used for the first time on the state highway system, materially lessened the contract cost. Monterey County cooperated in financing the structure. The bridge is 240 feet long.



THE SCENIC CUESTA GRADE—PRIDE OF DIVISION V—Views on the Cuesta grade, Coast Route, crossing the Santa Lucia range in San Luis Obispo County. The grades of the pioneer stage route have been reduced from 30 per cent to less than 7 per cent. The upper views show the ten-inch curb at the edges of the twenty-foot pavement, a feature of the construction. Lower right, nature of the "daylighting" at curves.

A MODERN MOUNTAIN GRADE

IN THE not so long ago, mountain grades were the bugaboo of motorists—the discouraging aspect of the motor tour. The skill of road builders and the genius of automobile builders, however, have wrought great changes in recent years.

From the beginning of the state system, engineers of the California Highway Commission have had visions of these steep, narrow and dangerous sections transformed into broad, safe highways with grades reduced and easily negotiable by all classes of traffic. They have striven constantly to bring their plans to completion, and, today, on many of the main trunk lines, the motorist looks forward rather with pleasure than dread at the approaching grade.

A commendable example on the California state highway system, recently completed, is the Cuesta grade, crossing the Santa Lucia Range on the Coast route, in San Luis Obispo County.

On Pioneer Route.

In early days, pioneer stages crossed the range at the same saddle now used by the state highway and followed down the canyon on grades steeper than 30 per cent. Some fifty years ago, a winding grade was constructed on the west slope of the canyon, with grades up to 12½ per cent. In 1915, under a contract let by the state, a new road was built down the east side with a 6½ per cent maximum grade and a roadbed of standard highway width.

On account of the heavy cuts and fills necessary, the new grade was allowed to settle and "find itself" for seven years before paving was attempted. Finally, in 1922, a contract was awarded for paving, including reshaping of the road surface, superelevation of curves, and "daylighting" of sharp points.

A reinforced concrete pavement, twenty feet wide and six inches thick, was laid with reinforced concrete curbs at the edges, ten inches high. Where the roadbed was wide enough to permit turning off the pavement, the curb was omitted, but an inverted curb of similar dimensions was placed beneath the pavement. This insured a maximum strength throughout the section.

Curbs Added Safety.

The concrete curbs give the motorist a feeling of safety when passing close to precipitous slopes, and also make the edge, which on many pavements is the weakest spot, the strongest part of all. In addition, it takes care of surface drainage, preventing it from scouring the shoulder next to the pavement and soaking into the subgrade underneath.

With its well banked curves, protected edges, and points opened up to give long vision, it is a pleasure to travel over the scenic Cuesta grade. Widely traveled motorists praise it as a fine example of mountain highway construction.

PNEUMATIC PAVEMENT BREAKERS ARE TRIED IN DIVISION VI

By Assistant Division Engineer S. T. Corfield.

THE maintenance department of Division VI has been experimenting with a portable pneumatic hammer for breaking concrete on a major patching job in Merced County. The pavement on which the breaker was tried was five inches thick, reinforced with lateral 3/8" bars, and exceptionally tough to break out by hand methods.

At the inception of the work, several days were spent breaking concrete by hand. Results were slow, the six laborers employed being unable to keep a one-sack mixer busy half the working day.

A 6 x 6 Ingersoll-Rand compressor and a Type CC25 Ingersoll-Rand pavement breaker were then placed upon the job. The output was doubled and only one man was required to actually break the concrete. Three and four other laborers were necessary to remove the broken concrete from the grade, but the mixer was kept busy eight hours a day. By noon each day or shortly afterward, enough concrete had been broken out to keep the mixer working the entire day.

Labor Costs Reduced.

Labor costs for the patching were reduced from 20 cents to 14 cents per square foot by the use of the pneumatic breaker.

Extensive patch work also has been done near Lost Hills, in Kern County, with the aid of a pneumatic breaker. The division's experiments indicate that the pneumatic breaker is adaptable to pavement repair work where any considerable amount of concrete is to be broke and removed.

The breaker's real value, however, lies not so much in the low cost of breaking the concrete, but in keeping the work ahead of the mixer, permitting it to operate for a full day instead of only part of the day, as is necessary when the slower hand methods are used.

Compressors used on these jobs should be mounted upon rubber tired trailers so that they may be moved rapidly from place to place. Such an outfit also may be used for rock drilling on emergency jobs.

NEW PLANK ROAD UNDER WAY

(Continued from page 9.)

eliminate one of the worst detours in the state. On sections of this unit the roadway has been placed upon an embankment built up with caliche deposits, a desert clay, with a macadam surface. The slopes have been oiled to prevent the drifting of the sand.

The problem of the desert is to prevent the roadway from being buried by the shifting dunes during windstorms. Often the road is completely obliterated until teams and scrapers can clear away the sand.

T. R. Goodwin is resident engineer on the plank road work which is in charge of Division Engineer E. Q. Sullivan at San Bernardino.

A rather portly, elderly woman, quite apparently a suburbanite, was puffing rather hard the other day as she tried to arise from a trolley car seat.

"Better eat yeast, mother. You'll rise better," a young collegian told her.

Like a flash the countrywoman came back: "Try it yourself, young man. You'll be better bred."—*Selected.*

HECKE THANKS DEPARTMENT

THE following letter has been received by Secretary F. W. Mixon from the Director of the Department of Agriculture regarding cooperation of state highway forces during the recent cattle epizootic:

Sacramento, Cal., October 7, 1924.

California State Highway Commission,
Forum Building, Sacramento, California.

I write to express my appreciation of the manner in which your department has cooperated in the control of the foot and mouth disease, not only once, but every time we felt that we needed your aid.

This was particularly true when your men were detailed with equipment to repair the Canyon road into the so-called Lumsdon Bridge Camp at the Forks of the Tuolumne River. In fact the assistance you gave us made possible our operation at that place, which, at this critical time, was of especial value and importance.

Sincerely yours,

G. H. Hecke,
Director of Agriculture.

GAS TAX POPULAR BECAUSE PAINLESS

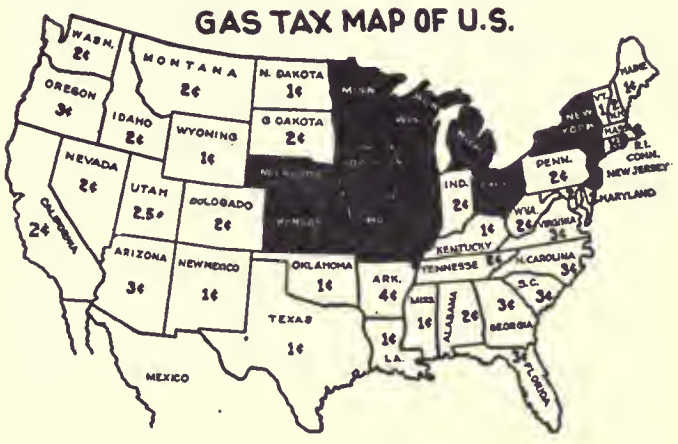
SWEEPING the United States on a wave of popularity even in these days of public clamor against taxation, the "gas tax" is called unique by its advocates.

Its popularity is held due to the fact that it is "painless"—hardly felt because paid indirectly in nickels and dimes at filling stations on just the number of gallons put into the tank at the time—and yet it produces large sums for good roads. Also, it is held the fairest tax because the most used cars and heavy ones pay in proportion to their benefits from good roads and the wear and tear they inflict upon them, and because tourists are made to pay toward the roads they use. It is the cheapest of all taxes to collect.

Thirty-six of the forty-eight states now collect gas taxes at from one to four cents a gallon as shown on the gas tax map above. Nearly all of the other twelve states are considering its early adoption.

The California Tax.

In California, the present gasoline tax is bringing in about $12,000,000 per year, one-half of which is distributed to the counties in proportion to the registration of motor vehicles. The remainder goes to the state highway commission and is specifically reserved by law for maintenance and reconstruction. It is not available for new construction.



No wonder some parts of the highways in this country are bad with the fellow in front burning them up and the fellow behind eating them.

WHAT THE DIVISIONS ARE DOING

TRINIDAD-ORICK SECTION OF REDWOOD HIGHWAY COMPLETED

AFTER having been under construction more than two years, the Trinidad-Orick section of the Redwood highway, in northern Humboldt County, has been completed by the Pacific Construction Company and opened to traffic. The new unit is seventeen miles in length and cost approximately $495,000, it is reported by Division I, in which it is located.

The section is one of the best examples of present California highway construction standards on a trunk line highway through heavily wooded country. Its width of roadway, alignment and grades makes it one of the "show" units of the entire Redwood highway. Approximately 500,000 cubic yards of material were moved during construction.

Convict Camp Moves.

The convict labor camp engaged in the construction of approaches to the Klamath River bridge at Requa has been moved to a new location on Smith River, on the Grants Pass connection, in Del Norte County.

Contractor J. F. Knapp has begun pouring concrete on the Eureka-Arcata contract, Humboldt County.

DIVISION II COMPLETES NUMEROUS NEW PROJECTS

A REVIEW of the work completed or nearing completion in Division II indicates a very busy summer on the part of Division Engineer H. S. Comly and his assistants. Completed projects include the following:

Ten miles of new twenty-foot concrete pavement between Redding and Bayha, on the Pacific highway;

Completion of grading on a twenty-mile unit of the Klamath River highway between Shasta River and Walker, in Siskiyou County. A large part of the work was done by convicts. Surfacing of the last ten miles is now being finished;

Surfacing of twelve miles of the Susanville lateral between Westwood and Chester, eliminating a very rough county road;

Surfacing of a ten-mile section of the Susanville-Reno highway between Lassen and Milford, Lassen County;

Construction of four miles of state highway east of Alturas, Modoc County, with county funds;

Improvement of the unconstructed portions of the state highway between Redding and Weaverville, greatly reducing the running time between these two points.

Projects Nearing Completion.

Projects in Division II nearing completion are:

Grading of two and one-half miles of the state highway from Weaverville, east, in Trinity County;

Improvement and surfacing of twenty miles of the Redding-Alturas lateral, between Burney and Fall River Mills;

Surfacing of nine miles of the Susanville lateral between Mineral and Morgan Springs, Tehama County;

Surfacing with asphalt macadam of four miles of the Susanville-Reno highway, immediately east of Susanville;

Widening, straightening and surfacing of fourteen and one-half miles of the Pacific highway south of the Oregon line, in Siskiyou County;

The realignment, widening and surfacing of ten miles of the Pacific highway between Bayha and Half Way Creek, in Shasta County.

DONNER SUMMIT GRADING CONTRACT ABOUT FINISHED

WITH 130 men at work and six air compressors and drills in operation, construction on the Donner Summit grading contract, Nevada County, is rapidly nearing completion and will be finished during the present working season. The new highway will cross the historic summit on a seven per cent grade and will eliminate one of the steepest sections of the trunk line to Nevada.

Good progress is reported on the three other grading contracts under way east of Auburn.

False work is in place for the reinforced concrete bridge across Truckee River and Southern Pacific railroad tracks at Polaris, on the Truckee River route. Pouring of concrete probably will not begin until next spring.

Grading has been completed on the 1.7-mile contract west of Chico, on the Chico-Orland lateral, and placing of asphalt concrete surfacing will start shortly.

Construction has been begun on a reinforced concrete bridge across the Cherokee Canal, on the main line, in Butte County.

Grading is under way on the 6.9-mile contract on the Tahoe-Ukiah route, west of Williams, Colusa County.

The power shovel crew at work widening the state highway in the vicinity of Lake Tahoe has suspended operations for the winter.

The commission has allotted funds for the construction of temporary approaches to the Stony Creek bridge on the Chico-Orland lateral, in Glenn County, and work will be under way by the time this is in print.

Studies are being made for the location of new rights of way for the state highway in the vicinity of Meyers and Tahoe City, at the southern end of Lake Tahoe.

RAPID PROGRESS REPORTED ON SKYLINE BOULEVARD

FIVE power shovels are being operated by Contractor J. P. Holland on the Skyline boulevard between Kings Mountain road and Bear Gulch road, San Mateo County, and good progress is reported by Division IV. Grading has been completed and rock surfacing is practically finished between Half Moon Bay road and Kings Mountain road. Surfacing is following closely the grading work.

Contractor D. A. Foley has two dredgers at work opposite San Bruno on the Bay Shore highway. A new steam shovel also is working on this contract near South San Francisco, together with donkey engines and dump cars. A quarter of a mile of temporary trestle has been built across the tide flats where a fill will be made.

PAVING IN THE "VALLEY OF THE MOON"—Views of paving operations between Beltane and Schellville, Sonoma County. Mechanical spreader and tamper in operation, insuring a smooth surface for the pavement. (Photos by Division IV.)

DIVISION ACTIVITIES

Paving on the Beltane-Schellville contract, in Sonoma County, has been completed and opened to traffic. A mechanical finisher was used on the concrete and a smooth riding surface is the result. The remainder of the grading and rock surfacing is scheduled for completion about November 15th. This includes that part of the contract between Agua Caliente and Beltane.

Several new concrete bridges on this route are being built to state highway standards by Sonoma County.

Curbs and gutters have been constructed through the business section of Menlo Park, in connection with the widening and thickening of the Peninsula highway between Redwood City and Palo Alto.

Widening of the state highway between Greenville and Livermore, Alameda County, was scheduled for completion October 20th.

COMMISSION ASSISTS COUNTY.

MADERA COUNTY has reason to believe that the commission does its part. Washington Boulevard, a macadam road west of Chowchilla, used as a detour during construction, was heavily damaged by the state highway contractor. The commission is now doing the necessary reconstruction work with the county assisting.

A second steam shovel has been added to the prison road camp equipment on the Kern River road.

Under an agreement between Fresno and Monterey counties and the highway commission, the state is now making surveys and plans for the construction by the counties and subsequent adoption by the state of certain portions of the Coalinga lateral.

BIG RECONSTRUCTION JOBS COMPLETED IN SOUTHLAND

SEVERAL large widening and thickening jobs have been completed in Division VII, southern California, and others are near the finish as winter approaches.

On the main trunk line between Los Angeles and Santa Barbara, on the Shoup avenue to the Los Angeles County line contract, the pavement has been widened to twenty feet and the roadbed to thirty feet. Numerous line changes have eliminated sharp curves. Calcium chloride was used for "curing" and tests made during and since construction indicate a strength of concrete equal to pavements cured with water by the usual "ponding" method.

On the same route, in Ventura County, paving is practically finished and only a small amount of shoulder shaping remains to complete the work as far as Camarillo, the end of the Hunter contract. Both jobs were undertaken with gasoline tax funds.

Whittier Boulevard Open.

The widening and thickening of the Whittier boulevard, between Pasadena avenue and Montebello, has been completed with concrete base, curbs and gutters. The seven-inch base has been surfaced with two inches of asphalt concrete. The total width is fifty-six feet, half of the cost having heen paid by Los Angeles County and a special road district. A big street dance celebrated the opening of the highway.

The Jahn and Bressi contract, between San Diego and Oceanside, is completed except that portion between Oceanside and Carlsbad. A mile of the Santa Fe railroad was moved between Cardiff and Encinitas to permit elimination of two dangerous railroad crossings.

Paving is progressing rapidly between Huntington Beach and Corona Del Mar on the Coast boulevard. C. P. Montgomery is resident engineer on this work.

Having completed the line change through the Callahan Ranch on the Ridge Route, Los Angeles County, state forces are now working toward Forest Reserve Inn.

NEW PLANK ROAD UNDER WAY.

CONSTRUCTION work is well under way on the 2000 feet of experimental plank road on the Sand Dunes in eastern Imperial County, Division VIII. Half of the section will be eighteen feet wide and the remainder ten feet wide. Redwood timbers previously cut to size are being used.

Grading on the unit from the Sand Hills to the Colorado River, at Yuma, is about finished.

ON THE TRUCKEE RIVER—Power shovel and tractor crossing the Truckee River on their own power for grading operations in the scenic Truckee canyon—a section of Victory highway and the Nevada trunk line connection.

Bids have been asked for the paving of the section between Beaumont and Redlands, Riverside County.

PROGRESS IN DIVISION X.

TWO asphalt concrete paving jobs are progressing rapidly in Division X. The contract from Banta to the westerly boundary of San Joaquin County is scheduled for completion at an early date.

Between Vacaville and Batavia, in Solano County, mechanical spreaders are in use in connection with paving operations. Placing of loam soil for building up shoulders in adobe sections and shoulder grading have been completed. The half mile of second-story concrete work in connection with this contract has been completed.

A contract has been awarded to Heintze and Leventon of Sacramento for the grading of 6.9 miles of the Rio Vista lateral between Suisun and Denverton, Solano County.

Grade Change Finished.

A 20 per cent grade at the top of Pacific Summit has been changed to 6 per cent by a revision completed at that point by Division X.

A concrete bridge is under construction by the county across Dry Creek, on the state highway in Amador County. Plans and specifications were prepared by the bridge department which is also supervising construction.

Maintenance forces of Division X are preparing to grade and surface a mile of state highway between Drytown and Central House, in Amador County.

The south approach to the Stanislaus River bridge, north of Salida, is being strengthened. Complete reconstruction is planned for next year.

Someone said that an automobile is masculine gender because it has a muffler and no female has ever been known to have a muffler.

DIVISION V FOREMAN DEVISES AUTOMATIC PUMP CONTROL

IN THE CONSTRUCTION of gravel shoulders near Soledad, Monterey County, in Division V, a portable 1000-gallon tank was used for filling the 1000-gallon sprinkling trunk in use on that work. It was found desirable to have a tank small enough to be easily portable in order that it might be set up at new locations as the work progressed. A small gasoline pump was used to fill the tank from irrigation reservoirs near the road.

To do away with the bother of shutting off the pump each time the tank was filled, C. R. Ruckledge, foreman on the work, devised an ingenious arrangement that served to shut the pump off automatically.

It consists of an insulated wire running from the spark plug of the gasoline engine to a bolt suspended at the level to which it is desired to fill the tank. When the water touches the bolt it short circuits the magneto and stops the engine.

When the sprinkling truck arrives for a load, the driver again starts the engine while the truck is filling. The arrangement has given perfect satisfaction in operation.

MISSOURI PLANS GAS TAX FUND

PETITIONS are being circulated in Missouri calling for submission of a constitutional amendment providing a continuing fund for road construction in the state.

The amendment will provide for a 2-cent gasoline tax and a 50 per cent increase in motor vehicle licenses. At a special election the constitutional law is to be submitted for amendment whereby $15,000,000 will be annually expended for building and improving roads. It is claimed that the road systems of Missouri would be completed within three years if the amendment goes through. Seven years will be required if the issue does not pass.—*The American County.*

FIVE WEEKS IN YUMA HOSPITAL IS BITTER DOSE

J. G. MORAN, chief of a location party down on the desert, has been spending a five weeks' vacation in Yuma's "popular" resort—the county pesthouse. He is not, however, at home to visitors. The reason is explained in a laconic telegram received by E. Q. Sullivan, division engineer, from K. L. Hallock, temporarily in charge of the party. It read, in part:

"Moran smallpox five weeks quarantine wire instructions Hallock."

"I don't envy Moran his vacation," said Sullivan. "There is only one place reputed to be hotter than Yuma, and after his five weeks' quarantine, Moran will be well acclimated."

Diplomacy.

At the grave of the departed, an old darky pastor stood, hat in hand. Looking into the abyss he delivered himself of the funeral oration:

"Samuel Johnson," he said sorrowfully, "you is gone. An' we hope you is gone where we 'spects you ain't."

Probably.

He—"There is an awful rumbling in my stomach—like a cart going over a cobblestone street."

She—"It's probably that truck you ate for dinner."

DIVISION VII ACTIVITIES—Smoothing up macadam surface with 40-disc scarifier near Azusa, on the Foothill boulevard, Los Angeles County; below, planing macadam surface through Newhall, five-ton tractor pulling two disc scarifiers and a six-foot grader to remove cuttings from discs.

SCARIFYING OIL MACADAM SURFACES IN LOS ANGELES COUNTY

THE surface of the oil macadam pavement between Los Angeles city limits and Saugus, a distance of 6.4 miles, was planed off recently with heavy disc scarifiers. Several stretches were rough and corrugated and it was necessary to work these over many times.

The equipment used consisted of a 5-ton Caterpillar tractor which pulled a 4-ton, 40-disc scarifier which was replaced later by two 18-disc scarifiers. A grader with 6-foot blade was trailed back of the scarifier to remove cuttings from the discs. One man in addition to the tractor driver was necessary to operate the equipment.

About thirty days time was required to do this work, the cost of which is shown as follows:

Labor (75 man days at $5)	$375 00
Equipment rental	606 69
Supplies (including gasoline and oil)	98 51
Total cost	$1,080 20
Cost per mile	168 78

The results obtained have been unusually satisfactory and there has been much favorable comment from stage companies and other users of the highway on the improvement effected, it is reported by Division VII.

The Polite World.

Mother—"You shouldn't behave that way with a young man!"

Daughter—"But mother, it's done in the very best advertisements."—*Life.*

Too Forward.

Traffic Cop—"Say, you. Didn't you see me wave at you?"

Mirandy—"Yes, you fresh thing, and if Andrew were here he'd paste you one for it."—*Sun Dodger.*

CALIFORNIA HIGHWAYS

OFFICIAL PUBLICATION OF THE

CALIFORNIA HIGHWAY COMMISSION

SACRAMENTO, CALIFORNIA

HARVEY M. TOY, Chairman;
N. T. EDWARDS and LOUIS EVERDING, Commissioners.

ROBERT M. MORTON, State Highway Engineer.

W. F. MIXON, Secretary.

We are pleased to permit publication of any of the matter contained herein and this privilege is extended newspapers and periodicals without restrictions.

FRANK B. DURKEE - - - Editor
P. O. Box 1103, Sacramento, California.

Vol. 1 OCTOBER, 1924 No. 10

JUST AMONG OURSELVES

☆ ☆ ☆

HIGHWAY NEWS NOTES

No Time for Radio Now.

GEORGE C. HANSON, of Division III, once a great radio fan, is one no longer. His entire attention is being given to a lusty pair of twins, a son and a daughter, recent arrivals at his home. He has named them Lawrence and Beverly, but to date has forwarded no receiving record covering same.

Miss Barbara Simpson, of the Division III staff, announces her wedding on September 27th to Edward E. Van Harlingen, of Sacramento. We wish her every happiness.

F. R. Baker has been assigned as resident engineer in charge of the asphaltic concrete pavement contract on the Chico-Orland lateral, Division III.

C. W. Rust has been transferred from the division offices to assist Baker at Chico.

Stork Visits VI, Too.

W. B. Reed, formerly maintenance foreman at Coalinga, Division VI, but now at Briceburg as levelman, announces the arrival of a daughter, born September 9th.

Harvey M. Toy, chairman of the Commission, gave an interesting talk on highways before a meeting in Fresno of the San Joaquin Valley Secretaries' Association.

The following employees have resigned to enter college: Geo. Benson, draftsman, Glenn C. Smith, levelman, and F. W. Montell and E. W. Ray, rodmen.

A. N. Wakefield has been assigned as chief of party on relocation work on the Coalinga lateral through Waltham Canyon.

Swickard Resigns.

AFTER several years' service on the field and office staff of Division V, Andrew Swickard has resigned to assume management of his farm and orchard properties in Santa Clara Valley.

During the time Mr. Swickard had been with the Commission, he has held several responsible positions, the last of which was that of Assistant Division Engineer in charge of Maintenance. The entire office and field staff of Division V regret to see Mr. Swickard leave the state's service. The staff presented him with a set of garden tools upon his departure.

H. T. Avery, office engineer in Division V, recently enjoyed a two weeks' vacation in the mountains of the Lake Tahoe section.

Temby Has "Back Yard" Farm.

C. J. Temby, of Division X, spent a part of his vacation doing "back yard farming."

Miss Lorene Gibson recently enjoyed the sea breezes at Stinson Beach while on her vacation.

Inspectors Visit Division VII.

G. R. Winslow, Chief Maintenance Engineer, accompanied by L. V. Campbell from Headquarters, recently made an extended inspection of southern California highways.

C. C. Morris, of the Bureau of Public Roads, spent a few days in Division VII, recently, inspecting construction work on the Ventura boulevard and on the Los Angeles to San Diego highway.

George H. Wray, Jr., has been transferred from Los Angeles County to the Coast boulevard between Corona Del Mar and Laguna Beach as assistant resident engineer. L. R. McNeely is also an assistant resident engineer on this job.

Undergoes Operation.

C. C. Darrow, chief clerk in Division I, recently underwent an operation for appendicitis.

Mrs. Virginia Pratt has resigned her position in the Willits office and has been succeeded by John W. Sanders.

E. R. Weigand, draftsman, has been transferred from Division VI to Division I.

A. J. Walden of Sacramento is now employed as clerk in Division I.

News From Division II.

AMONG recent visitors to Crater Lake, Oregon, are F. E. Davis, C. F. Woodin and family, Mr. and Mrs. A. F. Ager and Mr. and Mrs. Bachtold from the Dunsmuir office.

Merle Wilson and family have returned from a trip to Santa Cruz.

L. R. Redden announces the arrival of a son, Harold Roy. Congratulations.

E. J. Bassett, assistant engineer, has sold his property in Dunsmuir and has purchased a new home in Redding.

E. J. Gribble, recently in charge of surfacing work in Modoc County, has been transferred to Shasta County as maintenance superintendent near Fall River Mills.

W. I. Templeton, assistant resident engineer on the paving job north of Redding, has been transferred to maintenance work in Tehama County.

Transfers in Division IV.

Rex Mays, truck driver and chainman at Sonoma, has been transferred to maintenance work on state roads in California Redwood Park.

R. L. Kester, chainman, has been transferred from Livermore to Redwood City to act as weigher on the asphalt concrete work between Redwood City and Palo Alto.

CONGRATULATE McNEELY

At the conclusion of the World Series, engineers at headquarters sent the following telegram to Earl McNeely, former employee of Division III:

"You have been playing wonderful ball and we are proud of you. Congratulations."

MAINTENANCE FOREMAN MAKES FIND, BUT, ALAS, IT DOESN'T LAST

F. M. MEISNER, maintenance foreman at Calabasas, discovered Division VII highways paved with diamonds (but not for long). He writes to Division Engineer S. V. Cortelyou as follows:

> Monday, I found a pocketbook containing five rings, set with twenty-four diamonds, and $8 in money. Five of the diamonds had been lost by machines running over the book, breaking the rings and cutting the pocketbook full of holes; that part of the story sounds good, but today I found the owners (that sounds different).
>
> Some very dark colored people by the name of Jones were very delighted to find them and placed the value at $1,200. My dreams of wearing diamonds while spreading oil have all vanished.

THE FAMOUS HAUSER CONTRACT ALONG THE VENTURA COAST

ONE OF CALIFORNIA'S LARGEST GRADING CONTRACTS—(1) Industrial railroad of contractor, looking toward Point Mugu; (2) steam shovel and railroad equipment; (3) cliffs before construction; (4) Sycamore Canyon, contractor's camp; (5) steam shovel on center line, Black Point; (6) low tide along the cliffs; (7) a blast of forty tons of black powder; (8) a close up of the construction camp; (9) the big blast, Black Point; (10) after the blast, steam shovel at work. (Photos by Division VII.) See article on page 10.

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FRANK J. SMITH, Superintendent
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CALIFORNIA HIGHWAYS

OFFICIAL PUBLICATION OF THE CALIFORNIA HIGHWAY COMMISSION

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CONQUERING THE HISTORIC DONNER SUMMIT—View of the recently completed grade from Donner Lake over Donner Summit. Above, the new seven per cent grade climbing up from Donner Lake (in background). The old road is in the center of the picture and the dotted lines (at the left) indicate the location of a bridge which is yet to be constructed on the new grade. Below another view of the new roadway which replaces an 18 per cent grade. The new section is a part of the trunk line connection with Nevada on the Victory highway. See article on page five.

In this issue: KEEPING TRAFFIC MOVING ON THE REDWOOD HIGHWAY.

California Highway Department

California Highway Commission

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N. T. EDWARDS, Commissioner, Orange — LOUIS EVERDING, Commissioner, Arcata

R. M. MORTON, State Highway Engineer, Sacramento

PAUL F. FRATESSA, Attorney, San Francisco — W. F. MIXON, Secretary, Woodland

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G. R. WINSLOW, Maintenance Engineer

LOWELL R. SMITH, Purchasing Agent

HERMAN B. WEAVER, Chief Accountant

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H. S. COMLY, Division II, Dunsmuir

F. W. HASELWOOD (Acting), Division III, Sacramento

J. H. SKEGGS, Division IV, San Francisco

L. H. GIBSON, Division V, San Luis Obispo

J. B. WOODSON, Division VI, Fresno

S. V. CORTELYOU, Division VII, Los Angeles

E. Q. SULLIVAN (Acting), Division VIII, San Bernardino

F. G. SOMNER, Division IX, Bishop

J. C. McLEOD, Division X, Sacramento

General Headquarters, Fifth Floor, Forum Building, Sacramento

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NOVEMBER 1924

California Highways

VOL. 1 No. 11

Recent Changes in the Accounting System

By HERMAN B. WEAVER, Chief Accountant.

DURING the year 1924, a number of important changes have been made in the accounting system of the California Highway Commission looking to its efficiency and simplification. This article is a brief description of these changes and the general plan under which the accounting department functions.

HERMAN B. WEAVER

The passing of invoices, formerly done at the central office, is now handled by the divisions, thus making available to the divisions, at earlier dates, information in regard to expenditures.

Closer supervision of the work of the various divisions also has been accomplished by establishing the position of traveling accountant, who makes regular trips to the division offices for the purpose of giving instructions and seeing that the work is handled in the proper manner.

Costs Data by Sections.

The highways of the state are identified by routes between given points, which routes are numbered. Each route passing through a county is segregated therein into sections, which sections are designated by letters. One of the changes has been to have all the charges for each section accumulated in one place so that when a section of the road was under consideration, reference could be made to the records and full data obtained as to the cost of its construction.

The work of the California Highway Commission has advanced very rapidly, expenditures jumping from about $3,000,000 in 1917, to $18,000,000 in 1922, and $16,000,000 in 1923. During the same period, the accounting work has increased much more rapidly, due to the fact that additional new work has been assigned to the department, the principal items being the accounting for the federal aid and for the large amount of surplus war equipment received from the national government.

Public Funds Guarded.

As all expenditures made by the California Highway Commission are from public funds, every precaution is taken to see that the expenditures are properly made and that the goods or service has actually been received.

The expenditures of the Commission may be classified under four main headings, as follows: (1) contract payments; (2) salaries and wages; (3) traveling and incidental expenses of employees; (4) purchases of material, equipment, and supplies.

These classes of expenditures are handled in the following manner:

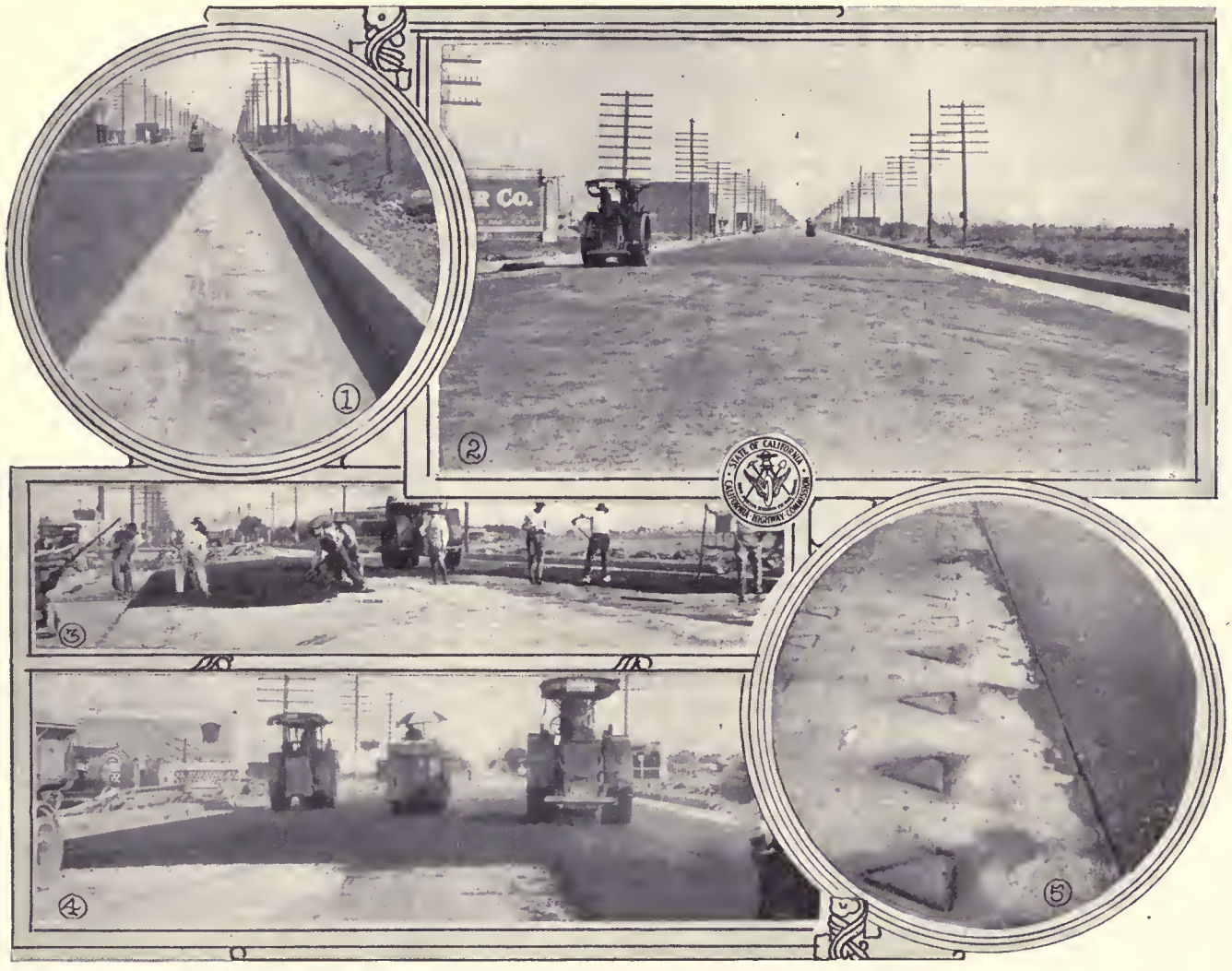
CONTRACT PAYMENTS—Contract payments are based on estimates made by the resident engineer on the job. These estimates are prepared monthly or semimonthly by the division engineer in whose division the work is located. They are then forwarded to central office where they are checked by the Engineering Department and passed to the Accounting Department where they are combined in schedules; these schedules are handled in the same manner as schedules described below under the heading "Purchases."

SALARIES AND WAGES—Pay rolls are prepared monthly at headquarters and in each division for the staff employees and weekly in each division for laborers and other employees on day labor work. When the pay rolls reach headquarters, they are also combined in schedules which are passed for payment. The employees carried on the weekly pay rolls are paid one week after the wages are earned, from a revolving

(Continued on page 5.)

CROSSINGS ELIMINATED IN SAN DIEGO COUNTY—The two Santa Fe railroad crossings eliminated by a relocation of the highway and railroad tracks in San Diego County. The old highway was abandoned between Encinitas and Cardiff, and the railroad moved over to provide a roadway for the new pavement along the ocean front. The new pavement is twenty feet wide.—A gas tax job. (Division VII.)

CALIFORNIA'S MOST COSTLY STATE HIGHWAY



FIGHTING TRAFFIC CONGESTION—Views on the reconstructed Whittier boulevard in Los Angeles County (Pasadena Avenue to Montebello) 56 feet wide; (1) the concrete curb and gutter, six feet wide seven inches thick; (2) the completed pavement, seven-inch concrete base and two-inch asphalt concrete wearing surface; (3) and (4) placing and rolling the asphalt surface; (5) methods used to bind asphalt surface; right, state contract using an asphalt paint; left, county contract using roughened concrete base—a gas tax job. (Division VII.)

THE answer of the Highway Commission to the tremendous traffic problem of the territory about the city of Los Angeles is California's most costly state highway, a fifty-six-foot street, approximately three miles of which have been completed on the Whittier Boulevard in Los Angeles County. Specifically, the construction extends from Pasadena Avenue to Montebello.

Half of the pavement was constructed by Los Angeles County and financed by the county and a special road improvement district, and the other half was built and paid for by the state with gasoline tax and motor vehicle revenues. The two jobs were awarded to the same contractor, George H. Oswald, and were carried on simultaneously.

The new highway has six-foot gutters and curbs built of concrete seven inches thick. The forty-four feet of pavement has a seven-inch concrete base laid upon four inches of rock macadam and disintegrated granite. A two-inch asphalt concrete wearing surface was applied, making the total thickness of the pavement nine inches.

Slight Difference in Plans.

Methods of construction employed by the county and the state were the same except for the method of binding the asphaltic wearing surface to the concrete base. The state finished the concrete smooth and applied a coat of asphaltic paint as a binder, while the county, after finishing the concrete, artifically roughened it with a tamper provided with lugs.

The cost of the state's half was approximately $74,000 per mile and the cost to the county was about the same, making the total cost of the highway in the neighborhood of $150,000 per mile.

The new highway provides a brand new "Main Street" for the town of Belvedere Gardens, a rapidly growing community of the Southland. Its main purpose, however, is to care for the increasingly heavy traffic, including a large number of commercial vehicles, between Los Angeles, Whittier, and Orange County cities.

NEW HIGHWAY ENDS TERRORS OF DONNER GRADE

THE steep grades and circuitous alignment of the road descending the eastern slope of the Sierra in Nevada County, a danger and annoyance to travel since the days of the fated Donner party, have at last given away to the determined assault of the road builder.

The acceptance by the California Highway Commission of the 3.32 miles of grading from Donner Summit easterly to Donner Lake recalls the struggles of the revered pioneers who blazed the first trails into California, and marks an important step forward in the progress of California highway construction.

A roadway averaging twenty-four to twenty-six feet in width, wider on the turns, of improved alignment and on a maximum 7 per cent grade, has taken the place of the old road with its 18 per cent grades, and sharp and narrow turns. Much of the new roadway is through solid granite, and its completion involved some of the most difficult construction in California.

Full Use Awaits Bridge.

With the exception of about half a mile near the summit, the road is now ready for traffic. This half mile will not be available until the completion of a 200-foot bridge across a deep ravine and the completion of 3.7 miles of road now under construction by the United States Bureau of Public Roads with forest highway funds. This contract extends from the summit westerly to Soda Springs.

The old grade from the summit to Donner Lake always has been a dreaded ordeal for traffic to and from Lake Tahoe or Nevada and eastern points. Its elimination is one of the important improvements accomplished in the construction of the main trunk line to the Nevada border. When the proposed bridge is completed a dangerous subway under the tracks of the Southern Pacific will be eliminated. The new road is located on the sunny side of the mountain which means its use for a longer period each year.

The new state highway is the third road to be built over the Donner Summit since the days when the emigrants took their wagons apart and drew them up over the cliffs with ropes. The first rough trail was replaced by a road with somewhat better grades, but on the shady side of the mountain. This, in turn, is now replaced by a wide, modern highway with easy grades and good alignment. It reveals unexcelled vistas of rugged mountains and, below, beautiful Donner Lake nestles like a jewel in a magnificent setting.

Few Jobs More Difficult.

The Donner Summit contract for grading and draining structures was awarded to J. Wilmshurst and Theo. Manetas, January 4, 1923. Work was begun in March, 1923, and was discontinued in December on account of winter snows. Progress was slow on account of the difficulty of breaking up and disposing of the hard granite through which all of the road is built. Few road jobs in the state have proved more difficult. The work was completed October 25, 1924.

As completed by the contractors, the roadway is composed entirely of broken rock. To make it travelable, it has been covered with disintegrated granite which will serve as a filler for the base upon which a future rock surfacing will be placed.

The location of the road and the major part of the construction was under the direction of former Division Engineer G. R. Winslow of Division III. J. W. Vickrey was both locating and resident engineer on the project.

CHANGES IN ACCOUNTING

(Continued from page 3.)

fund provided for that purpose. The staff pay roll employees are not paid until after warrant is received from the Controller, sometime after the first of the month.

TRAVELING EXPENSES—Under this head are included traveling expenses of employees and small contingent items, the accounts for which are prepared by the employees who incur the expenses and from time to time these accounts are assembled in schedules and the schedules take the regular course. In some cases, to avoid inconvenience or unnecessary hardship on the employee, advance payment is made from the revolving fund.

PURCHASES—As far as possible, all purchases are made through Headquarters Purchasing Department, the authority of the division engineers to make purchases being confined to emergency transactions which are necessary to avoid delay to the work and to service and commodities which can be obtained locally to better advantage. Purchases are made at headquarters upon requisition from the division or department requiring the goods.

It has been the policy of the Commission to advance no bills for payment until the goods have been received in satisfactory condition and a regular channel of audit has been established to insure this. Under this policy, after satisfactory quotations have been secured by the purchasing agent, a purchase order is issued to the vendor setting forth the quantity, description and price of the goods desired and giving shipping instructions for their delivery.

The original of this order is sent to the vendor, two copies are sent to the division office which in turn forwards one copy to the employee in the field to whom the goods are to be shipped and the fourth copy is retained at headquarters for the files of the Accounting Department.

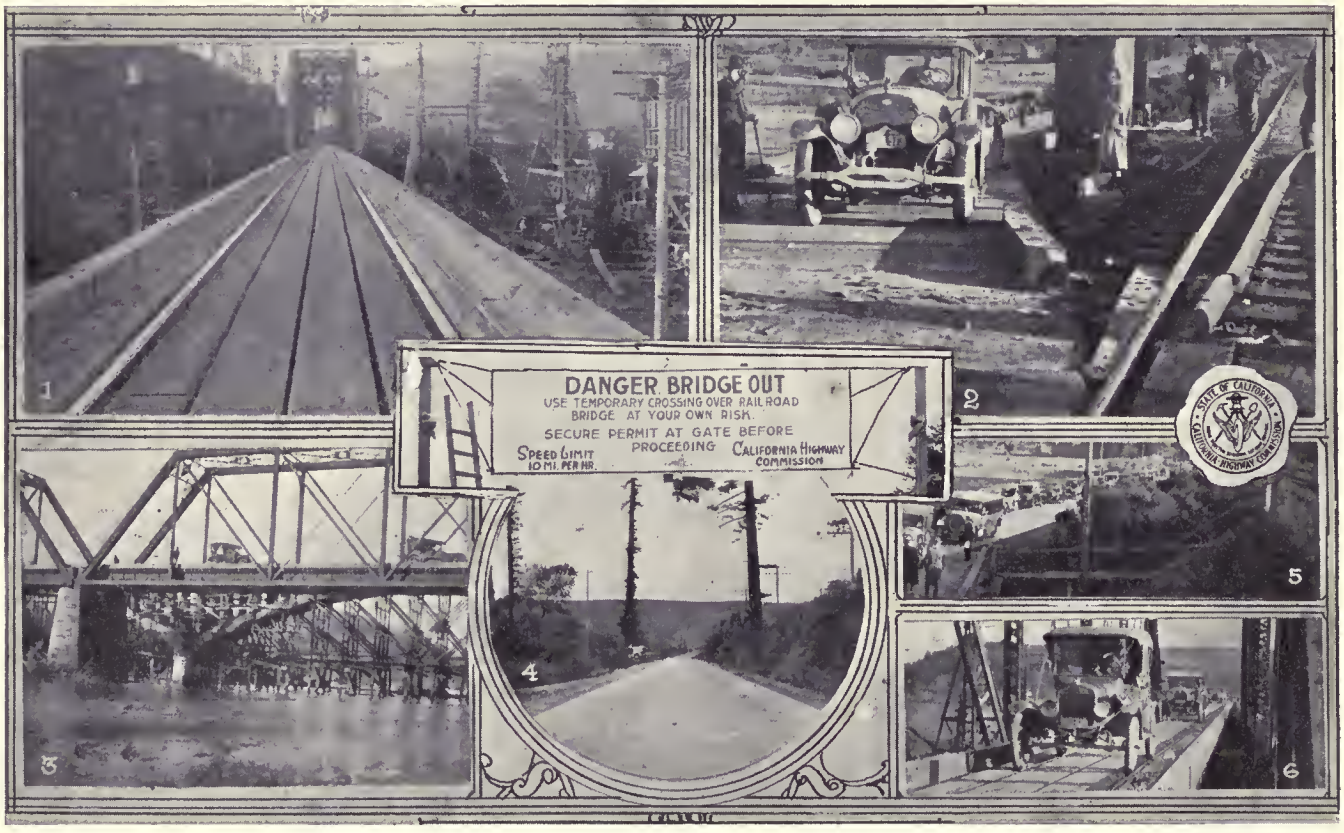
All Goods Carefully Checked.

Upon receipt of the goods they are carefully checked against the purchase order, both for quantity and quality, and a "receiving record" showing the receipt and condition of the goods is made up and forwarded to the division office.

In the meantime, the invoices (in triplicate) for the goods have been forwarded by the vendor to the division offices. These invoices are then checked against the purchase order and receiving record and appropriate accounting references and other data necessary for the proper segregation of the expenditures is noted thereon. These invoices are then grouped by funds and listed on "claim schedules" made up in quadruplicate. The original and duplicate copies of the

(Continued on page 7.)

KEEPING TRAFFIC MOVING ON THE REDWOOD HIGHWAY



KEEPING THE REDWOOD HIGHWAY OPEN IN FLOOD TIME—Scenes at the Van Duzen River, near Alton, Humboldt County, where a temporary crossing was swept away during recent floods. (1) Northwestern Pacific railroad bridge planked as an emergency crossing until the new bridge (at right) is finished; (2) Commissioner Louis Everding in his Lincoln, going up the approach to the railroad bridge, the first car over after the blockade was lifted; (3) machines crossing the railroad bridge; (4) large warning sign eected by the bridge department; (5) cars waiting to cross the bridge; (6) machines passing over the railroad structure. (Division I.) (Photos by Bridge Department.)

By L. D. Packard, Assistant Engineer, Bridge Department.

HOW the bridge department met a situation on the Redwood highway, in Humboldt County, caused by the biggest storm since 1876, should prove of interest to the readers of California Higways.

Near Alton, the department has under construction a reinforced concrete bridge across the Van Duzen River paralleling a bridge of the Northwestern Pacific Railroad. During the summer traffic was handled over a temporary structure and it had been hoped that the new bridge might be finished before the season of high water.

Prior to October 25th last, the Van Duzen River was practically dry. On that day it began raining, and early on the morning of October 28th, the detour bridge went out. Traffic was then routed over a county bridge which was washed away that afternoon.

This possibility had been foreseen by the bridge department, and an application was then pending with the railroad company for permission to use its bridge in case of emergency.

Commissioner Aids Engineer.

When the highway was closed to traffic because of the floods, Commissioner Louis Everding of Arcata made a personal appeal to the railroad officials and permission to floor the railroad bridge was received by bridge department engineers on the ground at 11 a.m., October 29th. The first truck load of lumber reached the site at 1 p.m. the same afternoon and a force of twenty-five men immediately began planking the railroad structure and construction of necessary approaches.

In the flooring of the railroad bridge, 55,000 feet of lumber was used and another 10,000 feet went into the two approaches. Two hundred cubic yards of grading also was done and 2500 feet of electric wire strung for the lighting of the bridge and the illumination of two large signs erected as traffic warnings. Approximately 1000 feet of the railroad bridge was floored.

Traffic had been held up less than four days when Commissioner Everding drove his Lincoln across the railroad bridge at 8.10 a.m., November 1st, the first car to cross.

Gates have been placed at the approaches and watchmen in the employ of the railroad and deputy sheriffs are on duty at all times to handle traffic. Temporary semaphore signals for the enginemen also have been installed.

Assistance Appreciated.

Members of the highway commission personally signed waivers releasing the railroad company from all liability in order that the bridge might be used and traffic accommo-

(Continued on next page.)

ACCOUNTING SYSTEM

(Continued from page 5.)

claim schedule, with the original and duplicate copies of the bills attached, together with triplicate copy of the schedule without attachments, are forwarded to headquarters. The fourth copy of the claim schedule, with the triplicate copies of the invoices attached, is retained in the division for its information.

When the claim schedules are received at headquarters, they are audited in the Accounting Department and approved by the State Highway Engineer (or assistant) and by the auditing committee of the commission. The original is then filed with the State Board of Control, the duplicate being retained by the Accounting Department. Like all other claims against the state, the highway claims go through a final checking and auditing by the Board of Control and, with its approval affixed, are advanced to the State Controller, who draws one warrant in favor of the disbursing officer of the commission for the total amount of the schedule.

Method of Payment.

Upon receipt of this warrant, the disbursing officer deposits it to the credit of the commission in one of the several Sacramento banks and the Accounting Department then draws checks in favor of the several parties whose claims were listed on the schedule.

These checks are signed by the secretary as the disbursing officer of the commission, and are countersigned by the State Highway Engineer or the chief accountant.

Transactions covering purchases made by the divisions are handled in the same manner, except that the purchase order is issued by the division engineer.

Schedules covering contract payments, salaries and wages and traveling expenses, are handled the same as schedules covering invoices, excepting that the schedules covering pay rolls are passed to the Civil Service Commission for checking before being filed with the Board of Control.

To a limited extent, advance payments are made from the division revolving funds for team hire, board and purchases, when the vendors are unable to extend credit. Such items are included in division revolving fund accounts which are sent to headquarters to be scheduled.

No Exception to Rule.

There is one exception to the rule that bills are not paid until the goods are received; on cement purchases, the cash discount is considerable and a check of the goods can be made without trouble. These bills are passed for payment as soon as received and an additional record is kept to see that the cement is afterwards received.

The system above described is simple of administration and is no more burdensome than is necessary in the expenditure of public funds. It results, however, in some delay in paying bills as the work of the commission is scattered all over the entire state and much of it is performed a considerable distance from the railroad stations at which the goods are received.

In handling the work of the department, the writer has been ably assisted by Assistant Chief Accountant Harry J. Pearce, who has occupied the position for the last three years. Carl M. Smith, formerly chief clerk of Division III, is the traveling accountant.

KEEPING TRAFFIC MOVING

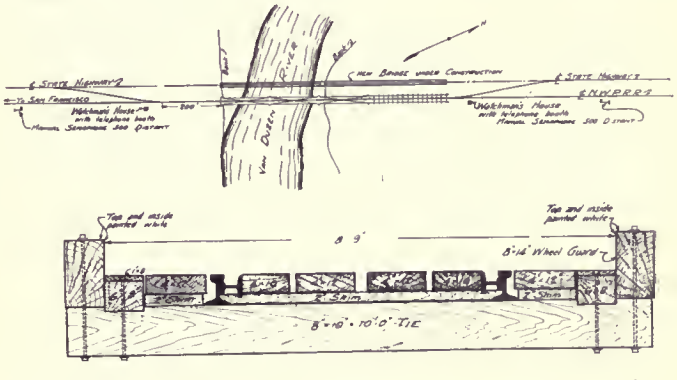
(Continued from page 6.)

dated. In turn, those using the bridge are required to sign a waiver in favor of the commission and the state.

The bridge department wishes to express its appreciation of the generous assistance given by Commissioner Everding, whose wide acquaintance in the community brought instant compliance with every request for help or materials. Thanks also are due officials of the Northwestern Pacific Company for their decision to permit use of the bridge, to the Mercer-Fraser Company for the expeditious manner in which the work was done, and to the Pacific Lumber Company for rapid delivery of lumber. Resident Engineer Albert A. Lernhart worked night and day in an effort to cope with the unusual situation and serve the public.

A single track pile bridge is now being driven across the Van Duzen and use of the railroad bridge will be discontinued when this has been completed. The flooring, however, will not be removed until the new highway bridge is completed and opened to traffic.

At its meeting in San Francisco November 15th, the highway commission adopted a resolution thanking the railroad company for its action in permitting the use of the railroad bridge at Van Duzen.



Sketch showing construction details of temporary floor placed on Northwestern Pacific railroad bridge at the Van Duzen River, Humboldt County.

FROM DISTANT LANDS.

Two distant lands recently have sent representatives to investigate California state highways. Mamerto Cruz, engineer of the Bureau of Public Works, Manila, Philippine Islands, and Mohammed Raffai, an engineer from Egypt, recently went over work in Division VI, escorted by Division Engineer J. B. Woodson. They were particularly interested in the prison road camps.

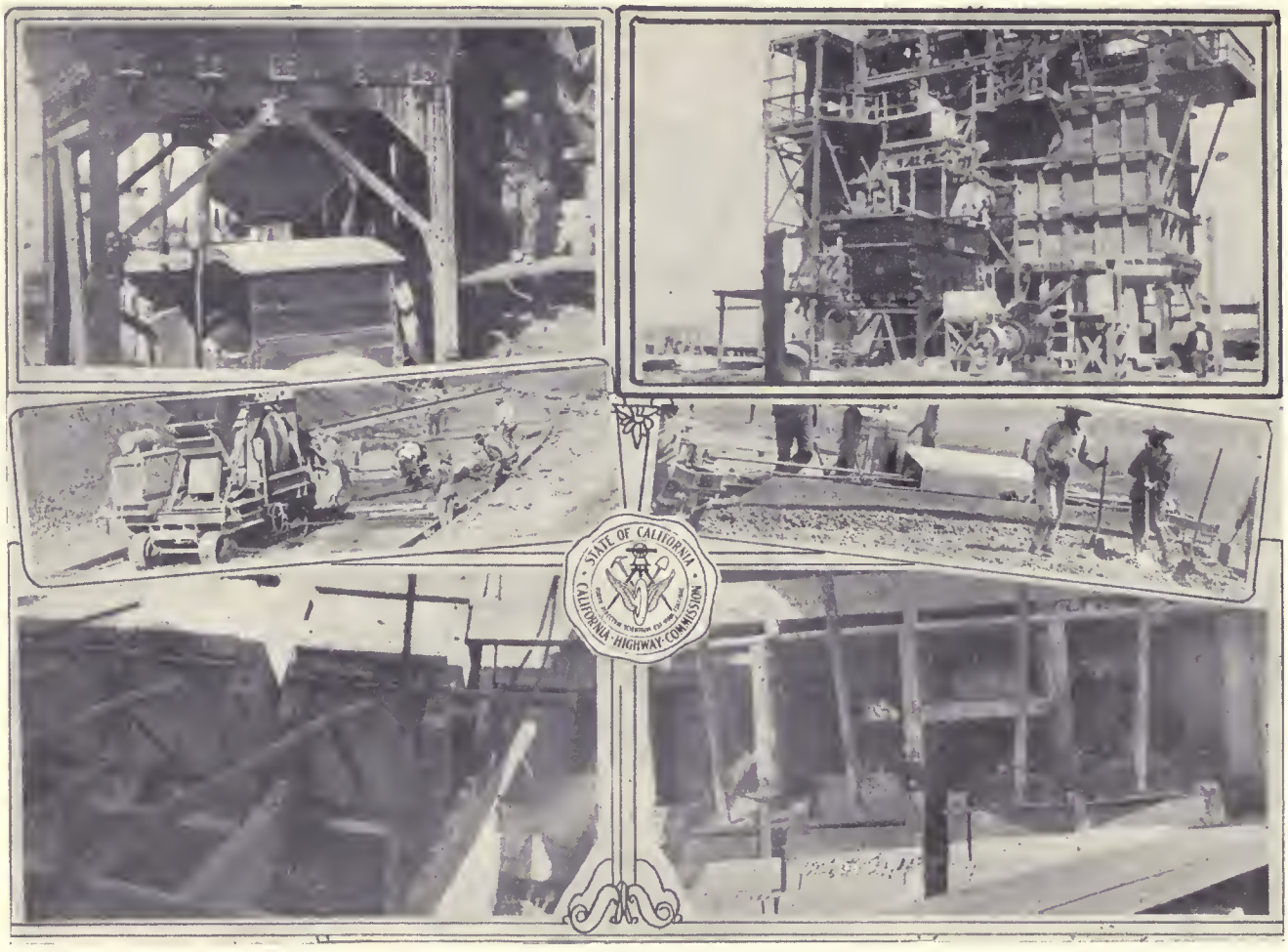
Saves Time, Anyway.

Brown—"Since I bought a car I don't have to walk to the bank to make any deposits."

Black—"Ah, you ride there?"

Brown—"No, I don't make any."

There are a lot of families in America so poor that they have only one automobile to their name.—*American Lumberman.*



WIDENING THE VENTURA BOULEVARD—Upper right, bunkers of the rock company furnishing materials for paving operations; upper left, loading compartment dumping from storage bin through adjustable batch box; left center, paver loading batch just received from dump truck; right center, mechanical surfacer used to spread and tamp concrete received from mixer; below, measuring boxes for proper proportioning of coarse aggregate from various size screens. (Photos by Division VII.)

VENTURA BOULEVARD JOB HAS ACCURATE PROPORTIONING PLANT FOR CONCRETE AGGREGATE

By W. D. Eaton, Resident Engineer.

WIDENING and thickening of the state highway between the southerly county boundary and Camarillo, Ventura County, on the trunk line between Los Angeles and Ventura, has just been completed and a greatly improved roadway is the result.

The old grade was widened to thirty feet, and a twenty-foot cement concrete slab, reinforced at the edges with wire mesh, was placed over the old fifteen-foot pavement. Curves of less than 300-foot radius were widened and replaced with curves of greater radius, and where the old fifteen-foot pavement was in good condition it was widened to twenty feet for a distance of about two and a half miles on the Camarillo end of the job with a two and one-half-foot concrete shoulder on each side.

Plan of Operation.

The fine and coarse aggregates for concrete were obtained from the Saticoy plant of the Orange County Rock Company and were hauled direct from the plant to the concrete mixer by trucks, the dump bodies of which were divided into four compartments, each holding a batch for the mixer.

As the trucks loaded with sand and rock passed through Camarillo, they received cement in sacks, direct from the cars, in the proper number for each batch of aggregate. A distinct advantage was thus gained, as materials were handled but once from the source of supply to the mixer. The number of dump trucks in use varied from sixteen to forty-three, the average haul being about twenty miles.

At the start, considerable difficulty was encountered in getting the grading of coarse aggregate to conform to the specifications. This condition, however, was overcome by the construction, at the plant, of a set of four measuring boxes for different sizes of rock, the size of each box being determined by screen tests of the aggregate taken from each individual screen. The total capacity of these proportioning boxes was equal to the number of cubic feet of coarse aggregate used in the batch.

Contents of the proportioning boxes were thoroughly mixed by discharging through a specially designed opening into a storage bin, the capacity of which was about four

(Continued on next page.)

PROPORTIONING PLANT

batches. From the storage bin the coarse aggregate was drawn into an adjustable measuring box set to hold the correct number of cubic feet for each batch, and then discharged into the trucks.

Accurate Measure Assured.

The fine aggregate was drawn directly from the bunker into an adjustable measuring box and discharged into the trucks.

The method employed gave an accurate measure of both the fine and coarse aggregate, the rock being properly graded by measure to conform to specifications.

A 21-E Multifoote paver was used to mix the concrete and the consistent daily run was about 500 lineal feet of twenty-foot pavement. An Ord surfacer handled the concrete after it had been deposited by the mixer.

Steel headers were used throughout the job. They proved satisfactory, were easy to place and to remove and relay.

Sam Hunter, of Santa Barbara, was the contractor on the job.

SEVERE SENTENCES POSSIBLE FOR ESCAPES FROM PRISON ROAD CAMPS

ACCORDING to an opinion of Attorney General U. S. Webb, the State Board of Prison Directors may fix sentences of one year to life imprisonment upon prisoners escaping or attempting to escape from prison road camps. Prison Director Thomas M. Gannon has informed the highway commission that the Board of Prison Directors will take advantage of the ruling.

For some time past, escapes from the road camps have been sentenced under section 106 of the Penal Code, enacted in 1921, which provides a penalty of one to five years imprisonment. Section 105 of the code provides a penalty of one year to life for escaping from state prison authorities.

The opinion of the Attorney General holds that there is no difference between escaping from the prison proper and escaping from the prison authorities outside the prison. Men in the road camps of the highway commission are under the discipline of guards from the prisons.

The repeal of section 106 of the Penal Code may be asked of the next legislature.

In fixing final sentence of men convicted of escaping from the road camps, the Board of Prison Directors, Director Gannon announces, will be governed by the circumstances of each case.

The highway department is now engaged in the compilation of the biennial report for the period ending June 30, 1924. It will be filed with the Governor in the near future.

The Highway Education Board, Washington, D. C., announces the distribution of $6,500 among the school children of the United States for the best essays on the solution of the traffic problem.

Not Well Planted.

"But whose fault is it," demands a writer, "if a pedestrian gets run over the second time?" Speaking off hand, we should say the undertaker's.—*Automobile Bulletin.*

SOMETHING DIFFERENT IN FINAL CROSS SECTIONING

By F. W. Haselwood, Acting Division Engineer.

FINAL measurement of excavation quantities on the grading contract from Donner Summit to Donner Lake (Contract 419, Nev. 37-C), recently was completed. As will be seen from the accompanying illustration, the field work in connection with these measurements involved considerable difficulty.

To eliminate the usual trouble encountered when final sections are platted and do not close with the original ground, the platting was done in the field as the elevations were taken. A drawing board was attached to a tripod and the cross section sheets were fastened to this board. Any failure of the section to close was noted at once and the cause, whether in the original or final sections, was ascertained and corrected. By this means, frequent trips to the field to check the notes were avoided and the cost of the work materially reduced.

The plan was suggested by J. W. Vickrey, resident engineer, and was carried out under his direction.

FINAL CROSS SECTIONING—Methods used on the Donner Summit contract to make the final measurement in the field of excavation quantities. (Division III.)

Popular Way to Get Chickens.

Wife—"Henry, dear, we must have a couple of chickens for dinner."

Hubby—"All right; I'll take a spin in the car."

Road hogs are motorists who put on speed every time you try to get in front of them.—*Toronto Star.*

THE POLLOCK CONTRACT ON THE MONTEREY COAST—Views on the recently completed Pollock contract south of the Big Sur River, Carmel-San Simeon highway, Monterey County; (1) the completed grade high above the breakers of the Pacific; (2) Redwoods near the Big Sur; (3) a blast at Grimes Point; (4) the great cloud of dust and rock settling over the ocean; (5) another view of the completed grade and the Coast line below; (6) troubles of the contractor, a power shovel wrecked by a slide. (Division V.)

DIFFICULT BIG SUR CONTRACT COMPLETED

By L. H. Gibson, Division Engineer, San Luis Obispo.

THE extremely heavy grading and peculiar construction difficulties encountered make the $1,000,000 contract for the building of that portion of the San Simeon-Carmel highway between Big Sur and Anderson Canyon, on the Monterey County coast, one of the most unusual and interesting projects so far completed on the California state highway system.

Award of the contract was made by the commission September 12, 1922, to the George Pollock Company of Sacramento and construction begun shortly thereafter. In the face of many difficulties, the thirteen miles of grading along the ocean front was completed October 4th, of this year.

Material Treacherous.

Much of the material encountered was of a very treacherous nature, slides in excess of 300,000 cubic yards occurring in spite of the dry period during which most of the construction was done. At one point, the excavation amounted to over 80,000 cubic yards in less than 700 lineal feet.

Slides and falling boulders frequently buried and smashed power shovels, requiring almost complete rebuilding in two or three instances. One shovel was dashed approximately

BIG SUR CONTRACT

600 feet into the ocean as described in the April issue of the highway bulletin.

Many times immense boulders and slides came within a few feet of workmen, or fell where men had been but a few seconds before. Considering the conditions, it is almost miraculous that the contract was completed without fatalities, and with only one serious accident.

He Had Enough.

In one instance, a man was carried down a hillside on top of a slide. When he landed at the bottom, uninjured, he picked up his hat and left the job without a word, not even asking for his pay. Perhaps he showed good judgment, for another workman caught in a somewhat similar way had his leg crushed so badly it had to be amputated. In the latter instance, it took ten men all night to carry the injured man through a driving rainstorm over mountain trails and sides to reach the nearest available transportation.

Such were the conditions under which construction was carried forward. During the dry season, the fine volcanic formation of the mountainsides created clouds of dust which made it almost impossible to operate the shovels at some points. There was constant fear of slides and erosion, even in the summer, often carried away large sections of the roadbed, which, due to the formation of the coast line, is located several hundred feet above the breakers.

Contractor Maintains Boat Service.

The grading was begun at the Big Sur River, the end of the present county road, some thirty miles south of Carmel. It is difficult of access and the contractor maintained a boat service from Monterey during winter months to bring in provisions, men, and needed equipment.

The strenuous efforts of the contractor to complete the work before the commencement of winter rains were successful. The grading was pronounced finished the day before the first rain of the season.

Credit also is due the final survey party which, under the direction of George A. Tilton, Jr., completed a particularly difficult job of cross-sectioning on the same day the contractor finished his work. E. B. Brown was resident engineer.

The San Simeon-Carmel highway was authorized by the bond issue of 1919.

MANY ATTEND CONVENTION

AS the Bulletin goes to press, the delegates are gathering in San Francisco for the tenth annual meeting of the American Association of State Highway Officials. Reservations indicate that practically every state in the Union will be represented and that the attendance of highway officials and engineers will exceed two hundred.

Chairman Harvey M. Toy, Commissioners N. T. Edwards and Louis Everding, State Highway Engineer R. M. Morton, Assistant State Highway Engineer T. E. Stanton, the heads of all departments from headquarters, and the ten division engineers were in attendance from California.

Details of the convention will be presented in subsequent issues of the Bulletin.

IN THE TRUCKEE CANYON—Scenes in the Truckee River Canyon where the Nevada trunk line (Victory route) is taking form. Above, the completed grade between Truckee and Boca; below, construction scene opposite Iceland between Boca and Floriston. The highway grade is about seventy feet above the river at this point. (Division III.)

Some Detour.

It rained and in order to keep touring cars moving on one of the detours, Resident Engineer A. N. George, one night, put a stop to truck traffic in order to prevent a complete blockade. An argument ensued between George and a truck driver.

In the meantime, an aeroplane flying between San Diego and Los Angeles was forced to land along side said detour and there it sat. Finally, one of the arguing truck drivers spotted the aeroplane hub deep in the mud.

"Boys," he said, "I guess Mr. George is right. If that areoplane can't get over this detour there is no use us trying it."

WHAT THE DIVISIONS ARE DOING

DIVISION I FIGHTS SLIDES; RAINFALL HEAVIEST IN YEARS

THE rainfall, in many parts of Division I, averaged over ten inches during October, and the downpour has continued during the greater part of November. Maintenance forces have been battling with thousands of cubic yards of slides but have kept the highway open for traffic. The bridge department lost several temporary bridges in the unprecedented floods, but only on one occasion was traffic held up for any length of time. The rainfall to date has bested all records since 1901.

Construction work has been hampered to a considerable extent. The two shovels in northern Mendocino County, engaged in widening and straightening operations, are now working but one shift per day.

The steam hoist and drag line outfit, at the southern approach to the Klamath River bridge, is still in operation and is the only equipment which could be used at this season at this location.

J. F. Knapp, contractor on the Eureka-Arcata paving job, is operating with two shifts whenever the weather permits the laying of concrete pavement.

The heavy storms have not seriously interfered with the work of the prison road camp on Smith River, as the excavation is largely through solid rock.

NEW DIVISION II OFFICE BUILDING NEARS COMPLETION

THE new office building and shops of Division II, located at Redding, are rapidly nearing completion and the moving of the division headquarters from Dunsmuir probably will take place sometime during December. The main shop building has been finished as has the grading and graveling of the lot. Work on the truck sheds and the fencing probably will be finished by the time this is in print.

After many delays, surfacing of the Mineral-Morgan Springs unit of the Susanville lateral, in Tehama County, at last has been completed by state forces. The moving out of the camp took place on the day of the first snowstorm of the season.

Necessary surfacing of various sections of the recently graded unit of the Klamath River highway has been completed along with all culvert work. All active construction on this road has now been suspended.

Contract Modified.

The oil macadam contract of Polk and Polk, east of Susanville, Lassen County, has been modified to a crushed rock surfacing for the easterly 2½ miles. Freezing weather interfered with the completion of the work as originally planned.

Dunn and Baker have a steam shovel at work widening the Pacific highway, north of the Shasta River bridge, on that portion of their widening and straightening contract not finished prior to the period of heavy summer travel.

The Nevada Contracting Company is ahead of its schedule for the widening and straightening of the Pacific highway between Bayha and Halfway Creek, in the Sacramento Canyon. Bids will be opened November 24th for similar work on the next eleven miles.

WORK TO CONTINUE DURING WINTER ON BIG JOBS IN DIVISION III

GRADING on the first unit of the Truckee River route, Truckee to Boca, is about finished and will be completed this winter. The rough grading is done and the finishing work is now in progress.

Work on the second unit, Boca to Foriston, also in charge of Irey and Holden, contractors, is well under way and construction will be continued during the winter months.

About 100,000 cubic yards have been moved on the Colfax-Gold Run contract, out of an estimated yardage of 338,000. Two power shovels are working three shifts a day and good progress is reported.

Rains have delayed the laying of 1.3 miles of asphalt concrete pavement near Chico, on the Chico-Orland lateral. Grading and gravel subbase are completed.

Giddings and White have begun grading operations on their 6.9-mile contract on the Tahoe-Ukiah highway, west of Williams, Colusa County.

W. P. Gay, of Orland, is furnishing material for the grading of approaches to the Stony Creek bridge in Glenn County. The work is in charge of state forces.

The grading contract on the state highway west of Donner Summit, in charge of the United States Bureau of Public Roads and financed with forest funds, is reported 75 per cent completed.

Maintenance Activities.

Division III has recently completed, or has under way, the following maintenance work:

Extension of culverts and removal of unnecessary guard rail on the main line in Glenn and Colusa counties;

Graveling of shoulders between Williams and Colusa;

Surfacing of two wooden bridges over the tracks of the Southern Pacific railroad near Bowan;

A 48 disc scarifier pulled by a Nash quad truck has been used to smooth up asphalt roads, east and north of Sacramento.

Surveys Under Way.

Surveys are under way on the Slippery Ford grade, on the Placerville road to Lake Tahoe, looking to its elimination. It is hoped sufficient gasoline tax funds may be allotted the division to accomplish this improvement next summer.

Funds have been given the division with which to make final surveys for rights of way for the state highway between Tallac and Tahoe City, at the south end of Lake Tahoe.

Plans are being prepared for grading 11.8 miles of the Placerville route from Sportsmen's Hall to Riverton.

DIVISION V NOW WITHOUT SINGLE GOING CONTRACT

WITH the completion of the big Pollock contract south of the Big Sur River on the Monterey coast, Division V cleaned up its last going contract and is now without a single contract under way. Except for a few specific maintenance jobs in connection with gravel shoulders and widening of the roadway, the activity of the division is now largely limited to general maintenance.

RECONNAISSANCE TRIP MADE OVER PROPOSED PIUTE PASS

A RECONNAISSANCE trip over a portion of the route of the proposed Piute Pass highway, which would connect Fresno, in the San Joaquin Valley, with Bishop, in Inyo County, was made October 15th and 16th by pack train from Bishop to Florence Lake. The following were in the party: Division Engineers J. B. Woodson and F. G. Somner, Assistant Highway Engineer W. S. Carnthers and W. C. Crosby, representative of the Automobile Club of Southern California. Piute Pass has an elevation of 11,409 feet.

County Aids Bridge.

Following a presentation of the matter by Division Engineer J. B. Woodson and Harlan D. Miller, acting bridge engineer, the Madera County board of supervisors voted $10,000 toward the construction of a new bridge over Chowchilla River on the San Joaquin Valley trunk line. Plans for the structure have been prepared and bids called for.

Two rock crushing plants have been established on the Mariposa-Briceburg section of the Yosemite Valley lateral to provide material for the surfacing of this unit. An effort is being made to complete the work before heavy winter rains.

MORE CONTRACTS FINISHED IN SOUTHERN CALIFORNIA

POURING of concrete on the Coast highway between Corona Del Mar and Huntington Beach, Orange County, Division VII, has been completed. This section of the ocean front road will be open to traffic upon the completion of the bridge across Santa Ana River, now under construction by Orange County under state

DIVISION ACTIVITIES

inspection. This bridge is taking on the appearance of a real structure. The new pavement is twenty feet wide.

Grading between Corona Del Mar and Laguna Beach, on the same route, is progressing rapidly. Over two miles of the rough work has been finished and a third of the culverts installed.

Widening Work Finished.

The contract for widening the roadway and extending culverts on 9.4 miles of the state highway in Orange County, south of Capistrano, also in Division VII, has been completed and accepted. The pavement already has been widened to twenty feet on this section.

The day labor camp on the Malibu Ranch, coast route, Los Angeles County, has been moved from Solstice Canyon to near Winter Canyon, that it may be nearer the grading operations.

By the time this is in print, it is probable the Jahn and Bressi contract for the widening and reconstruction of the highway between San Diego and Oceanside will have been completed. Numerous line changes have been made to improve the alignment. Two railroad crossings already have been eliminated and a third elimination has been provided for as soon as an overhead crossing over the tracks of the Santa Fe railroad can be built.

Special Maintenance Jobs.

A Division VII day labor crew, camped at Irvine, Orange County, is widening embankments and installing two large box culverts for the improvement of cross country drainage. Ditches connecting with the culverts are being built by owners of adjacent ranches.

Between Fullerton and Whittier, Los Angeles County, a special maintenance crew has been lengthening culverts and widening shoulders.

In San Diego County, a crew under the direction of Maintenance Foreman E. G. Brassington is paving with oil macadam two long fills, a part of line changes on the Jahn and Bressi contract. Paving with concrete will not be undertaken until after settlement of the new embankments.

NEW UNDERPASS IN USE ON NATIONAL OLD TRAILS ROAD

DIVISION VIII reports the new underpass under the tracks of the Santa Fe Railroad north of Oro Grande, on the National Old Trails route (Barstow-Needles), is now in use although not yet finally completed. The railroad track is supported on temporary bents which will be replaced by steel girders in the near future.

The commission has authorized the taking over of the Mecca-Blythe route for maintenance, and equipment is now being assembled at Desert Center where a camp has been established. The work will be under way by the time this is in print.

Residents of San Bernardino and Riverside counties are pleased with the action of the commission in advertising for bids for the paving of the 7.10-mile gap between Redlands and Beaumont. It is probable the work will be under contract by the time this bulletin is issued.

DIVISION X WIDENING CONTRACT IS COMPLETED

WIDENING of the highway between Rockville and Fairfield, Solano County, Division X, has been completed and will be open to traffic by the time this is in print. Flush concrete shoulders have increased the width of the highway to twenty feet.

The two asphalt widening contracts in Division X, in Solano and San Joaquin counties, have been delayed due to wet weather, but are nearing completion. On the Banta contract, in San Joaquin County, the contractors have laid as much as 450 tons of asphalt concrete per day.

Grading on the Suisun-Denverton section of the Rio Vista lateral, Solano County, is well under way and the county is preparing to place a water bound macadam surface in accordance with an agreement between the county and the state.

A maintenance crew expects to begin grading operations shortly between Jackson and Pine Grove, Amador County, in accordance with a recent cooperative agreement.

Electrical sirens for fog signals and an improved signal system for traffic are being installed on the Sacramento River bridge at Rio Vista.

BRIDGE DEPARTMENT NEWS

CONSTRUCTION activity at the Douglas Memorial Bridge across the Klamath River near Requa, in Del Norte County, is now under way on a large scale. Because of the importance of the work, Harlan D. Miller, acting head of the bridge department, is giving much attention to developments and has personally investigated the condition of the foundations, excavations for which are well under way. Nearly all of the foundation piles (almost 1000 in number) have been cut and delivered. F. Rolandi, the contractor, has installed an orange-peel dredger and an 8-inch dredger pump for excavation material from the cofferdams. Steel sheet piling and wooden sheet piling are being driven and at one pier the driving of foundation piles soon will be begun. Excavation at the south abutment is about complete.

Stewart Mitchell is resident engineer in charge at Requa. His assistant is J. C. Wilson. Both men have been in charge of large construction work before coming to California and are a valuable asset to the bridge department.

Progress at Van Duzen.

Albert Lernhart, resident engineer at the Van Duzen River crossing in Humboldt County, reports the bridge fast developing from the abstract to concrete. Concrete in the three arches has been placed.

W. H. Johnson, resident engineer on the six bridges in Tehama County, now completed, has been placed in charge of the construction of three bridges east of Susanville in Lassen County. The distance between two of these bridges is seventy-seven miles, which keeps Johnson busy.

Llewellyn DeCew, recently in charge of painting bridges in San Joaquin County, is assisting Johnson.

Kern Bridge Started.

G. W. Thompson has been placed in charge of the construction of the Cottonwood Creek bridge, east of Bakersfield, Kern County. This bridge will have a reinforced concrete girder deck on high two-post reinforced concrete bents.

Harry Carter, resident engineer on the San Lorenzo Creek bridge at King City, Monterey County, is now in charge of the building of seven wooden bridges and a weir in northern Lassen County, on the Alturas lateral.

H. M. Sturges has relieved Howard D. Lee in charge of the painting of the Petaluma Creek bridge in Marin and Sonoma counties. Lee has been transferred to headquarters in Sacramento.

Combination Crossing Under Way.

Up in the high Sierra, the department is building a bridge across the Truckee River and the Southern Pacific Railroad near Polaris, Nevada County, known as the Polaris overhead crossing. It will be a beautiful bridge, so situated as to show to good advantage. The main structure will be a 152-foot arch with a 38-foot rise across the river; at one end of this arch is a 60-foot two-girder span across the railroad tracks and a 38-foot approach span. At the other end of the arch are four 30-foot approach spans connecting with a roadway embankment 20 feet high. Work on this structure has been discontinued for the winter months. V. A. Endersby is resident engineer.

Contractor Charles L. East has completed the painting of seventeen wooden bridges on the Redwood highway in southern Humboldt and northern Mendocino counties. The clean white appearance of the structures is a marked improvement over the dull unpainted timber.

Work has been started on the 150-foot reinforced concrete bridge across the Cherokee drainage canal, on the Eastside highway, in Butte County. Butte County has contributed $5,000 towards cost of the structure. Charles W. Jones is resident engineer.

Smoothing the Way.

A Houston road-sign painter suggests the following signs for railroad crossings:

"Come ahead. You're unimportant."

"Try our engines. They satisfy."

"Don't stop. Nobody will miss you."

"Take a chance. You can get hit by a locomotive only once."—*Houston Post.*

There is a wide margin between a living wage and a flivving wage.—*Columbia Record.*

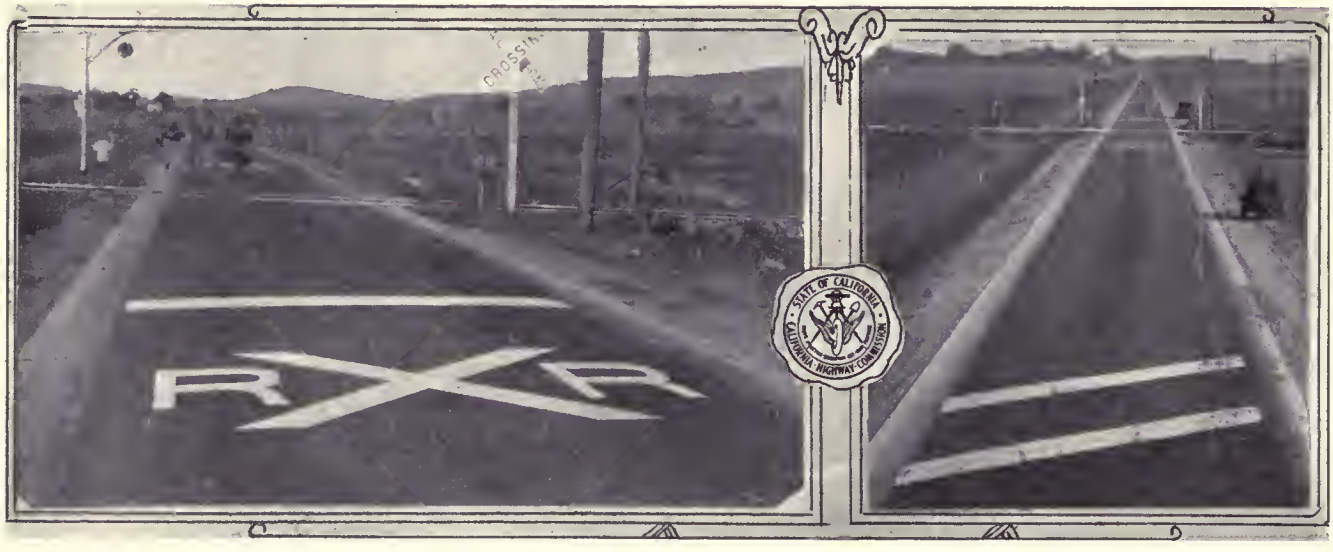
DIVISION IV TRIES NEW CROSSING WARNING

By Harry W. Schreiber, Maintenance Superintendent, Division IV.

DIVISION IV is trying out a new grade crossing warning at the Santa Rosa electric railway crossing on the Redwood highway in Sonoma County. It consists of two raised stripes placed 250 feet from the crossing and a larger R X R and a wider stripe painted on the pavement 50 feet from the railroad tracks.

The feature of the warning is the raised stripes which are built up with an asphaltic mix and are about three-quarters of an inch in thickness and eighteen inches wide. If passed over at high speed, these diagonal stripes are designed to give sufficient warning to the careless driver to place him on the alert that he may see the crossing warning in time. The two Rs are four feet long and the X eight feet.

The highway at this point is surfaced with asphalt and the stripes have been made with white traffic paint.



GRADE CROSSING WARNING IN DIVISION IV—The eighteen-inch white stripes, shown at the right, were built up to a height of approximately three-quarters of an inch with asphaltic mix before painting and are located 250 feet from the crossing. Fifty feet from the rails are located the four-foot letters R X R.

ENGLAND PLANS TO BUILD WIDER ROADS AND STREETS

COUNTRY roads and city streets to be laid out in Great Britain will have a right of way 120 feet wide in most instances and 100 feet wide as a minimum, if present plans of the government are carried out. Because motor traffic has made it obvious that the old narrow country roads are not in these days safe, public enthusiasm in England has greeted the official plan for the widening of existing roads and the establishment of the 120-foot width as the official standard for the future.

Long before the war the highways of England had become rivals of the railways through the use of motor trucks and steam traction engines, often hauling several trailers, each with a capacity of tons. The roads bore this traffic well and their splendid maintenance has enabled these highways to stand up under a much heavier traffic than 90 per cent of American roads receive. The plans of the British government will involve a total of several thousand miles of additional new construction destined to make London the center of the most adequately roaded section in the world.

The United States, just embarking with governmental assistance upon the construction of an interstate, nation-wide, primary highway system, will do well to consider the conclusions which an infinitely greater experience has forced upon British highway authorities. While few of our roads need a right of way 120 feet in width at the present time, that our growing traffic requirements now demand a much greater width is certain.—*Highway Engineer and Contractor.*

Note.—The California Highway Commission, as a policy, has adopted eighty feet as the minimum width of rights of way for state highways.

IT WAS SOME PARTY

THAT'S the opinion of everyone lucky enough to have been present at the dancing party in Elks' hall on the evening of November 14th, attended by folks from headquarters, Divisions three and ten, the shops, and the laboratory, and their friends.

To Tom Wright of the headquarters drafting room goes the credit for initiating the affair. He made good with a five-piece orchestra, cards, punch, decorations and everything that goes to make up a good time.

Having put over the dance, Tom says it is now up to Mr. Mixon and Clay Chipman to arrange for a Christmas tree

Horrors!

An Irishman coming out of ether in the ward after an operation exclaimed audibly:

"Thank God that's over."

"Don't be too sure," said the man in the next bed. "They left a sponge in me and had to cut me open again." And the patient on the other side said: "Why, they had to open me, too, to find one of their instruments."

Just then the surgeon who had operated on the Irishman stuck his head in the door and yelled: "Has anybody seen my hat?"

Pat fainted.—*Exchange.*

Murder!

"You say his wife wants to get rid of him? How do you know?"

"She told him she had read a decision which gives the pedestrian the right of way over automobiles, and she is insisting that he stand on his rights."—*Houston Post-Dispatch.*

CALIFORNIA HIGHWAYS

OFFICIAL PUBLICATION OF THE

CALIFORNIA HIGHWAY COMMISSION

SACRAMENTO, CALIFORNIA

HARVEY M. TOY, Chairman;
N. T. EDWARDS and LOUIS EVERDING, Commissioners.

ROBERT M. MORTON, State Highway Engineer.

W. F. MIXON, Secretary.

We are pleased to permit publication of any of the matter contained herein and this privilege is extended newspapers and periodicals without restrictions.

FRANK B. DURKEE - - - - Editor
P. O. Box 1103, Sacramento, California.

Vol. 1 NOVEMBER, 1924 No. 11

JUST AMONG OURSELVES

☆ ☆ ☆

HIGHWAY NEWS NOTES

HIGHWAY ENGINEER NAMED TO IMPORTANT POSITION

J. O. MARSH, office engineer, Division VII, has resigned to accept the position of chief engineer of the Public Utilities Department of the city of Los Angeles to which he was recently appointed. He assumed his new duties November 1st. Mr. Marsh has had wide experience in engineering work in various lines which fits him to undertake the task of working out a plan for a metropolitan transportation system for Los Angeles. The forces of Division VII extended best wishes for his success in the new position and presented him with a handsome brief case.

E. J. Saldine, assistant resident engineer on the Jahn and Bressi contract, has been transferred to the headquarters of Division VII in Los Angeles. He has been succeeded by W. J. Nelson.

J. B. Hodges, resident engineer, has been transferred from Division VII to the bridge department. He has charge at the Santa Ana River bridge in Orange County.

Roy S. Wright, draftsman in Division I, has resigned to accept a position with the city of Oakland.

Broken Cable Results in Death.

GEORGE W. RICE, foreman in Division II, was killed November 3d while superintending the moving of a rock crusher near Castella, Shasta County. A broken cable resulted in Mr. Rice being struck by a flying tackle block. He died shortly after in a Dunsmuir hospital. Robert J. Streif, an employee of the commission, was injured in the same accident. Foreman Rice was 48 years of age and is survived by a widow.

F. E. Davis, M. E. Wilson, and Eli Dallas, draftsmen in Division II, brought in a 3-pointer and two 4-pointers following a hunting trip in Shasta County prior to the closing of the season.

Dan Wise has returned to Division II as senior clerk.

L. H. Williams has sold his property in Dunsmuir and will move to Redding when the new division headquarters are opened.

Among engineers and employees who have purchased property in Redding in anticipation of the moving of the division office are: E. J. Bassett, F. Heard, J. G. Standley, and E. N. Babb.

R. W. Van Stan has been transferred to division headquarters following completion of the Redding paving contract.

F. C. Macaulay has been transferred to Redding as maintenance superintendent.

Changes in Division III.

T. H. DENNIS, assistant division engineer, has been assigned additional duties and is now in charge of all maintenance work of the division. A considerable part of his time is spent in the field.

J. C. North, assistant maintenance engineer, has been placed in charge of specific betterments and day labor maintenance jobs in Division III, several of which are now in progress.

W. G. Remington, assistant resident engineer, and C. E. Thompson, field draftsman, on the Donner Summit grading contract, have been temporarily assigned to the division office. W. C. McNeely, draftsman, also is back in the office from the same job.

William Eichel, for several years in charge of Route 17, north of Auburn, as maintenance foreman, passed away recently. The work is temporarily in charge of Superintendent D. D. Bruening.

W. A. Smith, office engineer, is the proud possessor of a new Jewett sedan.

Cities Get Division V Men.

I. B. Ramseier and W. E. Barney, until recently draftsmen in Division V, are now connected with the city engineering offices of Los Angeles and Pasadena, respectively.

Conforming to the usual custom, Douglas Patton, of the Division V accounting department, passed around the cigars upon the arrival of a seven-pound boy, R. D. Patton, Jr., on the morning of October 29th.

G. A. Tilton, Jr., Division V resident engineer, has been transferred temporarily to Division VI to act as chief of party on location work in the Kern River Canyon.

O. H. Rordorf, draftsman, also has been transferred to Division VI, taking up the duties of field draftsman.

It's a Girl.

Carl Nelson, maintenance foreman at Mariposa, Division VI, announces that number four is a daughter.

O. D. Gaston has been appointed acting maintenance foreman at Coalinga, replacing W. B. Reed, who is now at Briceburg in charge of surfacing operations.

A representative of the Los Angeles *Times* was an interested visitor recently at the prison road camp in Kern River Canyon.

Z R 3 Brings Letter.

MISS DELLA BITTKE, of the Division VIII office force, is the proud possessor of a letter brought from Germany by the Z R 3 on its recent history-making trip across the Atlantic. The postage amounted to 80 cents and the stamps are of a special design made especially for the occasion by the German government.

R. C. Wright, draftsman, has resigned from the Division VIII staff to become a deputy United States immigration inspector at El Centro.

R. L. Young, assistant division engineer, and H. S. Payton, resident engineer, have returned to Division VIII after performing special services for Division VII during the repaving of the Whittier boulevard.

N. H. Tatspaugh, maintenance foreman at Waterman Canyon, has been transferred to Coachella and C. R. Taylor, foreman at Coachella, is now stationed at Waterman Canyon.

Howard Noble and survey party have been transferred to Fawnskin, on Big Bear Lake, in connection with relocation surveys.

Bag Four Pointers.

Two hunters in Division X were among the successful nimrods of the season. A. M. Nash and R. W. McCrea each bagged a four pointer before the season closed.

E. C. Dozier, with the California Highway Commission for eleven years, took unto himself a wife during the latter part of October and went east on a honeymoon.

Headquarters News.

Miss Kathryn B. Melarkey, of the Department of Prison Road Camps, enjoyed a short vacation recently visiting relatives in Reno, Nevada.

Miss Fern Dunkeson visited in San Francisco and Dunsmuir while on her vacation.

Mrs. Martha Anderson, personnel clerk, is another of the office force who visited San Francisco during her vacation.

Miss Beulah Francisco, secretary to Assistant State Highway Engineer T. E. Stanton and formerly headquarters personnel clerk, is in San Francisco on a leave of absence.

Sam Puts One Over.

Sam Potasknick, designer in the bridge department, gave the boys quite a surprise on the day before election by announcing his marriage to Miss Ray Berman of Los Angeles. He passed out cigars and candy in celebration of the event before leaving on his honeymoon.

The map above does not show all of the state highways in California but only those included in the federal aid system, representing approximately 7 per cent of the total road mileage of the state, outside of cities.

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FRANK J. SMITH, Superintendent
SACRAMENTO, 1924

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CALIFORNIA HIGHWAYS

OFFICIAL PUBLICATION OF THE CALIFORNIA HIGHWAY COMMISSION

Vol. 1 DECEMBER, 1924 No. 12

SWITCHBACKS ON THE WATERMAN GRADE—A view on the state highway leading from San Bernardino to Arrowhead and Big Bear lakes in the San Bernardino Mountains—one of the heavily traveled recreational roads of the state. Originally built as a toll road, negotiations are now under way looking to a survey for its reconstruction on easier grades as a forest highway project. (Div. VIII.)

In this Issue: "WHAT I GOT OUT OF THE SAN FRANCISCO MEETING."

Happy New Year

EB 2 8 1925

California Highway Department

California Highway Commission

HARVEY M. TOY, Chairman, San Francisco

N. T. EDWARDS, Commissioner, Orange — LOUIS EVERDING, Commissioner, Arcata

R. M. MORTON, State Highway Engineer, Sacramento

PAUL F. FRATESSA, Attorney, San Francisco — W. F. MIXON, Secretary, Woodland

Headquarters Staff, Sacramento

T. E. STANTON, Assistant State Highway Engineer

FRED J. GRUMM, Engineer in Charge of Surveys and Plans

C. S. POPE, Construction Engineer — G. R. WINSLOW, Maintenance Engineer

HARLAN D. MILLER, Bridge Engineer — R. H. STALNAKER, Equipment Engineer

L. V. CAMPBELL, Office Engineer

BEN H. MILLIKEN, Superintendent of Convict Road Camps

HERMAN B. WEAVER, Chief Accountant — LOWELL R. SMITH, Purchasing Agent

Division Engineers

T. A. BEDFORD, Division I, Willits

H. S. COMLY, Division II, Redding

F. W. HASELWOOD (Acting), Division III, Sacramento

J. H. SKEGGS, Division IV, San Francisco

L. H. GIBSON, Division V, San Luis Obispo

J. B. WOODSON, Division VI, Fresno

S. V. CORTELYOU, Division VII, Los Angeles

E. Q. SULLIVAN (Acting), Division VIII, San Bernardino

F. G. SOMNER, Division IX, Bishop

J. C. McLEOD, Division X, Sacramento

General Headquarters, Fifth Floor, Forum Building, Sacramento

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DECEMBER 1924

California Highways

VOL. 1 No. 12

HIGHWAY CONVENTION INSPIRATION TO WEST

AMERICAN ASSOCIATION ENDORSES NEEDED LEGISLATION

THE inspiration of the tenth annual meeting of the American Association of State Highway Officials, which came to a successful conclusion in San Francisco last month, will have a lasting influence on western highway building. California engineers and those of nearby states returned to their tasks with a new vision of the great undertaking in which they are engaged, confident of an appreciation of their problems by other sections of the country.

In point of attendance, the convention, the first to be held west of the Rockies, was the largest in the history of the association. Forty states and the Territory of Hawaii were represented, registered delegates numbering nearly 300, including the entire staff of the Bureau of Public Roads.

Papers to be Published.

CALIFORNIA HIGHWAYS will not endeavor to review the important papers presented, as these will be published in full in the official organ of the association. Suffice it is to say, that contact with the leading highway builders of America was an invaluable opportunity of which our engineers took full advantage. A brief summary of their impressions will be found elsewhere in this issue.

Every effort was made to make the stay of the visitors pleasurable. Prior to the opening of the convention, a large number were met in Sacramento and taken to San Francisco in automobiles, and at its conclusion sixty of those attending, from twenty-four states and Hawaii, accepted the invitation to make a two-day motor trip from San Francisco to Los Angeles as guests of the California Highway Department. The entertainment provided by San Francisco during the four days of the convention received most hearty commendation.

The paper presented by State Highway Engineer R. M. Morton on the use of convict labor in highway building in California was received with marked attention, and the discussion of "Needed Highway Legislation for Public Land States," by Chairman Harvey M. Toy, resulted in the unanimous adoption of a resolution expressing the desire of the association for the enactment into law of the Colton bill now pending in congress.

This measure provides for the removal of the limitation per mile on federal aid and 100 per cent federal aid for sparsely-settled public land states. Its approval by congress is urgently desired by the west.

Other important resolutions adopted urged appropriations for roads within the national parks; continuation of the regular federal aid appropriations; working out of a plan for uniform marking of all transcontinental highways; and an increase in the salary of the Chief of the Bureau of Public Roads to not less than $12,000 per year.

Officers Chosen.

The following officers were elected:

F. F. Rogers, Chairman Michigan Highway Commission, President; Frank Page, Chairman North Carolina Highway Commission, Vice President; L. D. Blauvelt, Chief Highway Engineer, Colorado, Secretary; Frank T. Sheets, Chief Highway Engineer, Illinois, Treasurer.

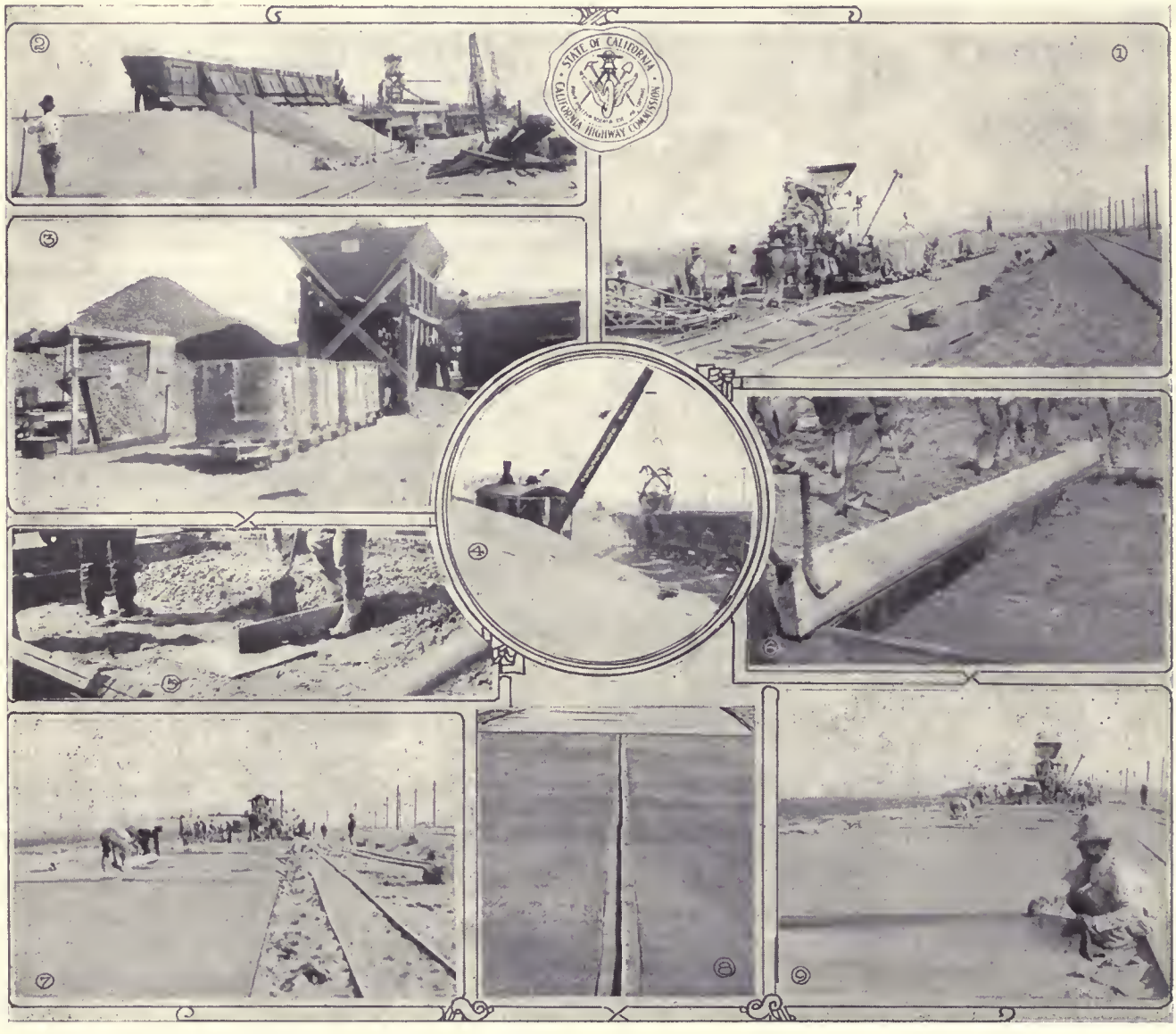
Board of Directors, five-year term—Thos. H. MacDonald, Chief Bureau of Public Roads, Washington, D. C.; C. M. Babcock, Highway Commissioner, Minnesota.

Director, two-year term—F. R. White, Chief Highway Engineer, Iowa.

Mr. Toy remains on the Board of Directors as one of the representatives of the west, having been elected to a five-year term at the New Orleans Convention a year ago.

CUYAMA FOREST HIGHWAY PROJECT—Views on the section of the Cuyama state lateral in Santa Barbara and San Luis Obispo counties under construction by the Bureau of Public Roads as a forest highway project. See article on page ten.

BUILDING THE HIGHWAY ALONG THE ORANGE COUNTY COAST



CONSTRUCTION SCENES ON THE HUNTINGTON BEACH-NEWPORT SECTION OF THE OXNARD-SAN JUAN CAPISTRANO ROUTE—(1) Smith paver equipped with power derrick for unloading aggregate boxes from industrial railroad; (2) train of side dump cars depositing material for embankment adjacent to new Santa Ana River bridge; (3) Industrial cars with aggregate boxes being loaded from proportioning bins; (4) Erie shovel with clamshell bucket loading dump cars with material for embankments; (5) placing experimental precast concrete block under intersection of longitudinal center joint and the transverse expansion joint. Block buried in subgrade with top flush with top of subgrade and covered with roofing paper to prevent bond with bottom of concrete slab; (6) placing expansion joint before shutting down at noon. Expansion header accurately set; (7) longitudinal float and belt in use to finish concrete surface; (8) completed longitudinal center joint; (9) strips of burlap kept moist used to protect green concrete pavement.

NEW COAST HIGHWAY BREAKS TRAIL ALONG THE OCEAN FROM HUNTINGTON BEACH TO NEWPORT

By C. P. Montgomery, Resident Engineer.

A SPLENDID new highway where none existed before between Huntington Beach and Newport, on the Orange County coast, soon will be open to motor traffic. Completion of the bridge across Santa Ana River, now under construction, will permit travel over the three and a half miles of new pavement recently completed.

This unit of paving, sublet to H. H. Peterson, is a part of the Huntington Beach-Corona Del Mar contract of W. F. Beal. Grading has been completed on the unpaved portion, which is also ready for traffic.

Commencing at Huntington Beach, the new state highway parallels the Pacific Electric and Southern Pacific railroads along the ocean beach, crosses the Santa Ana River and runs along the base of the bluff past Newport to Promontory Point where it climbs eighty feet to the picturesque cliffs overlooking beautiful Newport Bay, and extends on southward through Corona Del Mar.

Sand is Construction Problem.

Breaking trail for a new highway through sand dunes along the ocean front rendered the use of motor trucks impossible, and necessitated the installation of an industrial railway to haul materials and supplies. At Macklin Siding, a supply base and central proportioning plant were established. Tracks for the industrial railroad were extended in both directions. Fordson tractors were converted into locomotives to haul the strings of side dump cars loaded with embankment material, or industrial cars carrying wooden batch boxes of proportioned aggregate for the concrete pavement. Material was loaded with an Erie shovel provided with a clamshell bucket.

Methods of Construction.

Headers were set after the grading was completed and the subgrade shaped and rolled. A compact base was secured for the concrete pavement by flooding the subgrade with water, soaking the sand to a depth of about 18 inches.

The concrete pavement was 20 feet wide, 6 inches thick in the middle, and thickened to 9 inches at the outer edge. It was laid full width, with a longitudinal center joint as well as transverse expansion joints.

The center joint was made with a ½-inch by 6-inch pine board held at each end by two 1-inch by 2-inch stakes driven to within one and one-half inches of the ground and nailed through both stakes and board. Boards were held rigid by a channel iron fitting over the top and held in place until concrete was poured on each side for almost the entire length of the wooden strip, the proper center of which was done with a "two by four" with a bracket to fit over the header and a lug to fit in a hole in the channel iron.

The grade of longitudinal strips was secured by stretching a string over 1-inch blocks held on the headers, to conform to the crown of the pavement.

Expansion joints, placed at noon and night, were about 250 feet apart and were formed by header boards, 2½ inches at the top tapering to 2 inches at the bottom, cut to conform with the crown of the pavement and well oiled. They were removed in from three to five hours. To insure easy riding joints, all expansion headers were blocked up so that the top fitted perfectly with a hand tamper, corresponding to the crown of the tamper blade on the Lakewood mechanical tamper.

For the first three-quarters of a mile south of Huntington Beach, standard expansion joints corresponding to the cross-section of the pavement were used with ½-inch reinforcing steel rods placed 2 inches from the surface. This was done in each of the four corners formed by the intersection of the center longitudinal joint with the transverse expansion joint. Each corner was reinforced with an 8-foot bar bent 90 degrees at the center and two 4-foot rods, wired together in the form of a fan.

New Experiment Tried.

Along a short stretch of pavement, 2-feet by 2-feet by 6-inch precast concrete blocks were placed under the intersection of the center joint and the expansion joints to support the four corners. These blocks were buried in the subgrade flush with the top of the subgrade and covered with a piece of roofing paper to prevent a bond with the pavement slab.

Most of the expansion joints were a full 9 inches deep, with the pavement thickness tapering back to 6 inches in 3 feet on both sides of the joint. Here the four corners were reinforced as described above. All expansion joints were filled with a mixture of sawdust and asphalt.

Concrete aggregate was shipped from the Orange County Rock Company to Macklin Spur, and unloaded directly from the cars to the bunkers.

Aggregates Measured.

Aggregate for each batch was measured in a box at the bottom of the bunkers and loaded into boxes on Kippel batch box cars. As trains passed the cement cars, the correct number of sacks of cement were loaded on each batch box.

Tamping of concrete was done with a Lakewood mechanical tamper. Finishing was accomplished with a roller, a 16-foot longitudinal float operated from two bridges, and two canvas belts. The mixer began at 7.00 a.m. and quit at 3.30 p.m. to allow finishers time to keep off green concrete with the finishing belt and still complete their work before dark. An average of about 500 lineal feet of pavement per day was laid.

This construction is on a unit of the Oxnard-San Juan Capistrano route authorized by the bond issue of 1919.

Reconstruction and Maintenance Income for 1924, $8,825,101.67

THE income of the California Highway Commission for reconstruction and maintenance received during the calendar year 1924 totaled $8,825,101.67. This represents the state's half of the motor vehicle license fees and the gasoline tax, divided as follows:

License fees, $2,762,028.92; gasoline tax, $6,063,072.75.

The gasoline tax law went into effect September 30, 1923. Distribution of the proceeds for the first twelve months was made in May and November of 1924. The collections for the last quarter of 1924 will be received by the commission in May, 1925.

In February, 1925, the motor vehicle fees for the last half of 1924 will be distributed and it is expected the state's share will be approximately $564,000.

Counties Get Equal Amount.

An amount equal to that received by the state from the motor vehicle fees and the gasoline tax has been divided among the several counties in proportion to the number of registered automobiles.

According to a statement of the Controller, rebates authorized by the gasoline tax law amounted to $842,022 during the first year the act was in effect. The Attorney General reports that information in his hands shows $769,744.48 in gasoline taxes delinquent. Ultimate collection of this sum depends upon the decision rendered in suits now pending in the courts for the adjudication of the law.

Use Limited.

The funds received by the State Highway Commission from the sources outlined above are reserved by law for maintenance and reconstruction of existing state highways and can not be used for new construction.

"What I Got Out of the San Francisco Meeting"

THE CALIFORNIA HIGHWAY DEPARTMENT was represented at the San Francisco convention of the American Association of State Highway Officials by the three members of the commission, the attorney and secretary, the state highway engineer and his assistant, the heads of all departments from Sacramento and the ten division engineers and some of their assistants.

Through the Bulletin, Mr. Morton asked those attending to prepare a brief outline of their impressions of the gathering and the good accomplished. These interesting statements are presented below:

HARVEY M. TOY, Chairman, California Highway Commission—Programs of other sections of the country, as outlined at the convention, make certain that California must speed up highway construction or be outdistanced by other states, many of which are adopting the gasoline tax method of financing. Eastern officials were given first-hand information concerning the problems of western states, with a result that they have a more kindly attitude toward them. I appreciated the opportunity to discuss administrative problems with high officials of other states.

LOUIS EVERDING, Highway Commissioner—Much good was accomplished by the convention in San Francisco. The exchange of ideas and information between our engineers and those of other states can not help but be beneficial to them and to California. Personally, the opportunity I had to meet visiting commissioners was appreciated more than words can express.

NELSON T. EDWARDS, Highway Commissioner—The association meetings provide an opportunity for nation-wide cooperation among the states on important matters of national highway legislation.

T. E. STANTON, Assistant State Highway Engineer—I believe the value of my services to California have been increased by contact with men of national prominence in highway work, who have risen to their positions by virtue of their ability to handle, in a broad and able manner, the many problems continually confronting the highway executive. The opportunity to discuss traffic problems of highway transport directly with officials of the Bureau of Public Roads was of great value, especially in view of the fact that California is beginning to face serious problems similar to those of the east.

W. F. MIXON, Secretary, California Highway Commission—My vision has been broadened by the week of contact with men of intellect, vision, energy and determination—men who have faith in one another and in the ultimate completion in the United States of a great network of improved highways.

PAUL F. FRATESSA, Attorney, California Highway Commission—I learned that the $200 annual dues which California pays to the association is one of the best investments the state makes. Through these meetings, the states are enabled to act as a unit in securing federal appropriations and other favorable highway legislation.

FRED J. GRUMM, Engineer in charge of Surveys and Plans—The meeting was an invaluable opportunity to hear men prominent in highway work discuss their problems and efforts to meet them. It eliminates delay and waste in highway building by providing the means for disseminating reliable information relative to the experience of the several states.

C. S. POPE, Construction Engineer—The most interesting feature of the San Francisco meeting was the contact with leading engineers of other states and the Bureau of Public Roads. Discussion in the Committee on Design convinces me that, in the construction and design of pavements, California ranks with most eastern states. Some give more thought to theoretical considerations, but in practical construction we are on a par with the others. In the treatment of soils, I found no one with ideas in advance of what California is doing. Some of the papers did not receive the discussion to which they were entitled, and in the future more time should be given to general discussions from the floor. My proposal that contractors be paid on the basis of strength of concrete, as well as volume, did not arouse objections, and some seemed to think it might be a good idea.

G. R. WINSLOW, Maintenance Engineer—A better understanding of the means and methods of overcoming maintenance difficulties in other states was what I got out of the San Francisco meeting. This first-hand knowledge was acquired by personal contact and interviews with visiting engineers from other sections of the country.

R. H. STALNAKER, Equipment Engineer—What I got out of the San Francisco meeting was a realization of the splendid spirit of cooperation existing between the states and the Bureau of Public Roads, and a fuller appreciation of the importance of the great work in which we are all engaged—the building of the highways of the nation. I was particularly impressed with Mr. MacDonald's presentation of the need of uniform traffic laws, and the discussion of mountain road construction by Dr. Hewes.

HARLAN D. MILLER, Bridge Engineer—A serious consideration of bridge design and construction for three days prior to the convention by men who are among the foremost bridge experts of the country brought the realization that California bridges are equal to or better than those of other states. Many matters were argued at length in the committee, and at the conclusion, the chief bridge engineer of the Bureau of Public Roads said that he was glad to know that California's ideas regarding bridges were so nearly identical with his own. I gained confidence in our own bridge practice, and came away from the meeting with a feeling of pride in California state highway bridges, as well as much valuable information gained from other states.

C. L. McKESSON, Research Engineer—The greatest value of the meeting was its tendency to give a broader viewpoint. Problems of engineering can not be solved in any one state, and real forward progress must come from the cooperative effort of all engineers, utilizing every possible means for interchange of ideas and experiences, and results of experiments.

The technical discussion developed that in concrete pavements the practice is rapidly standardizing on the thickened

CALIFORNIA DELEGATION AT THE SAN FRANCISCO MEETING OF THE AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS—Standing, left to right—Ben H. Milliken, Superintendent of Convict Road Camps; C. L. McKesson, Research Engineer; C. S. Pope, Construction Engineer; Fred J. Grumm, Engineer in charge of Surveys and Plans; Harlan D. Miller, Bridge Engineer; W. F. Mixon, Secretary, California Highway Commission; Louis Everding, Highway Commissioner, Arcata; Harvey M. Toy, Chairman, California Highway Commission, San Francisco; Nelson T. Edwards, Highway Commissioner, Orange; R. M. Morton, State Highway Engineer; T. E. Stanton, Assistant State Highway Engineer; Paul F. Fratessa, Attorney, California Highway Commission, San Francisco; Herman D. Weaver, Chief Accountant; R. H. Stalnaker, Equipment Engineer; G. R. Winslow, Maintenance Engineer; Frank E. Durkee, Bulletin Editor. Kneeling, left to right—T. A. Bedford, Division Engineer (Div. I), Willits; H. S. Comly, Division Engineer (Div. II), Redding; F. W. Haselwood, Acting Division Engineer (Div. III), Sacramento; J. H. Skeggs, Division Engineer (Div. IV), San Francisco; L. H. Gibson, Division Engineer (Div. V), San Luis Obispo; J. B. Woodson, Division Engineer (Div. VI.), Fresno; S. V. Cortelyou, Division Engineer (Div. VII), Los Angeles; E. Q. Sullivan, Acting Division Engineer (Div. VIII), San Bernardino; F. G. Somner, Division Engineer (Div. IX), Bishop; J. C. McLeod, Division Engineer (Div. X), Sacramento.

edge type, now in use in California. Twenty-four states out of thirty-one reporting are using the thickened edge. The day of haphazard concrete is gone forever, and the time is nearer when Mr. Pope's dream of concrete bought and paid for on a strength basis will be realized.

Several days spent with engineers of the Bureau of Public Roads engaged in research investigations was of the greatest value. There was an opportunity to check California methods, progress and personnel against those of other states and my conclusion is that our state, in the rapidly developing science of road building, is fully abreast of the times. But we must keep on our toes if we are to stay in the front rank.

HERMAN B. WEAVER, Chief Accountant—The convention gave me an opportunity to get a bird's-eye view of the road building situation in the United States. The great problem everywhere, as in California, is the question of finance. To learn about conditions in other states makes one realize that California is fortunate; we want more roads, but we are better able to pay for them. An interesting proposal was the one for numbering transcontinental highways.

BEN H. MILLIKEN, Superintendent of Convict Road Camps—After hearing the splendid talk by Mr. Morton, our chief engineer, on the use of convict labor in California, and the discussion by O. T. Reedy of the Colorado highway commission, which followed, I am more than ever convinced that California is the leading state in the use of prisoners in road building. The fact that in California the highway engineers are on the job until the road is finished, and the pay feature, make for the success of our system.

T. A. BEDFORD, Division Engineer, Willits—The paper of R. W. Crum of Iowa on the weighing of concrete aggregate opened my eyes to a method which seems to offer superior results. The paper of James Allen, Washington State Highway Engineer, on problems of mountain road construction, was particularly interesting, and drove home the feeling that principles of aesthetics often must be sacrificed in designing roads to safely carry a large volume of traffic.

H. S. COMLY, Division Engineer, Redding—The most striking and interesting feature to me was the report of the Committee on Highway Transport. The collection of statistical data and research along these lines should furnish logical information on which to base every step in the building of a highway to serve the actual economic needs of the community. Highway engineering is still young, and we have little economic data on which to base the design, administration or financing of highways. Data on highway transport, which the Bureau of Public Roads is now collecting in the east, should be expanded to cover all sections of the country and correlated and digested into orderly deductions. Such information is particularly desirable in California at the present time when so much reconstruction of highways is in prospect.

Other interesting points were brought out in the paper and discussion on tests of concrete aggregates, particularly regarding the effect of the moisture content in sand, and the weighing of aggregates. The latter seems desirable for many reasons, and the paper read at the meeting clearly brought out these points and demonstrated the practicability of this method.

F. W. HASELWOOD, Division Engineer, Sacramento—The meeting offered an opportunity for forming a personal acquaintance with recognized leaders in the field of highway building. The formal meetings, with technical papers and discussions, revealed the fact that a great deal of concentrated and clear thinking is being applied to the problem of highway construction. Highway engineering is still in a stage of rapid transition, but certain well-defined principles are being developed. The engineer must be continually on the alert if he wishes to keep up with his profession, and such meetings offer opportunity for gauging the advances that have been made. Many interesting facts were brought out in the committee meetings.

J. H. SKEGGS, Division Engineer, San Francisco—I was most impressed by the unison of purpose, of steadfast devotion to practical, technical and economic development of

(Continued on page 11.)

Department Purchases Cover Wide Field

By Lowell R. Smith, Purchasing Agent, California Highway Commission.

MAKING the purchases for so large an undertaking as the construction of the California state highway system, extending as it does over thousands of miles, is no small undertaking. Probably in no other department of the commission's activities is there greater opportunity for economic handling of public funds.

Lowell R. Smith

Since the reorganization of the highway department, authorized by the legislature of 1923, the purchasing agent of the highway commission has been relieved of the duty of making purchases for the Divisions of Architecture, Engineering and Irrigation, Water Rights, and Land Settlement, now grouped in the Department of Public Works. This change has made possible a concentration of effort and a more efficient handling of highway purchases.

Distributed Over State.

The latter now total slightly more than $2,000,000 annually and cover thousands of items involving business transactions in hundreds of cities and towns up and down the state. They necessitate familiarity with freight rates, a study of the market, and close cooperation with other department heads within the organization to insure the greatest value per dollar expended.

The California Highway Commission operates, on maintenance and day labor work, a fleet of approximately twelve hundred motor trucks and passenger cars, in addition to gasoline tractor equipment, shovel equipment, etc. For this equipment the yearly purchases of gasoline, oil and grease amount to $380,000. In point of money value this is the largest single item purchased by the commission. This department executes price agreements yearly with the different oil companies in the state for lubricating oil and grease. The base price paid for lubricating oils under these price agreements is 31 cents per gallon. On gasoline the commission is now securing 3 cents off the market price. The yearly tire bill for trucks and passenger cars is $105,000.

The next item purchased in point of money value is major equipment. During the biennium of June 30, 1922, to June 30, 1924, there was expended for motor vehicle equipment $182,283.95. The greater portion of this expenditure represents replacement of vehicles worn out in service. The purchase of other road building equipment, exclusive of motor vehicles, during the same period, was $370,106.59.

Machinery Big Item.

The buying of road building equipment for the commission covers a wide field, including such items as road graders, rock crushers, power shovels, tractors, air compressors, snow plows, asphalt heating equipment, road drags, mowing machines, concrete mixers, scarifiers, wagon loaders, etc.

This department works in close touch with the Equipment Department in the purchase of road building machinery, as the latter department is responsible for the maintenance and upkeep of such machinery, maintains a thorough system of inspection, and at all times is in close touch with the wants and needs of the various divisions throughout the state.

Perhaps the most interesting single purchase of road building equipment during the last biennium, although not exceeding some other purchases in value, was the purchase of thirty-four road graders. This purchase was made at the direction of the state highway engineer in an effort to systematize grader purchases and to effect as much of a saving as possible by purchasing the yearly requirements of graders at one time rather than piece-meal throughout the year.

Saving on Graders.

An approximate saving of 15 per cent was made by purchasing the grader requirements in this manner. At that time, in addition to the purchase of thirty-four graders of one make, a single grader of each of the competitive bidders was purchased for purpose of trial and comparison.

The purchase of repair parts for the maintenance of equipment is also a large item. For motor vehicle equipment, staple items in wholesale lots are purchased and stocked. These purchases include such items as spark plugs, bought in lots of from 4000 to 5000; horns, fan belts, magnetos, and in fact all items where a saving can be effected by quantity purchases.

This department formerly purchased all road building materials for contract work as well as for maintenance and day labor work. Early in 1923 the state highway engineer established a policy under which contractors furnish all road building materials with the exception of corrugated metal pipe for culverts. This reduced considerably the purchase of road building materials, although the department is still purchasing large amounts of rock, sand, cement, asphalt, etc., for day labor and maintenance work.

Last year's purchases of rock and sand amounted to $162,000; asphalt $50,000; cement $50,000; culvert pipe $112,000; and calcium chloride $51,000. The larger portion of the culvert pipe purchased was for contract work.

Culvert Pipe Purchases.

Below is given a tabulation of culvert pipe purchases since the beginning of highway construction in 1913:

Year	*Amount of culvert pipe purchased*
1913	$1,157 81
1914	98,031 82
1915	71,974 77
1916	22,604 81
1917	49,969 65
1918	75,340 47
1919	63,759 79
1920	50,639 11
1921	107,239 86
1922	116,558 69
1923	98,114 05
1924 (to July 1, 1924)	63,411 82
Total culvert purchases to July 1, 1924	$818,802 65

Other large yearly purchases of supplies and materials consist of explosives, approximately $100,000; hardware,

approximately $75,000; engineering supplies and equipment, $25,000; paints, $20,000; plumbing supplies, $22,000; electrical materials, $5,000; and lumber, $50,000.

Convict Purchases Interesting.

Among the interesting phases of the purchasing is that done for the convict labor camps. The Purchasing Department works in close touch with the superintendent of these camps in making purchases for them so that no opportunity will be overlooked in keeping these camps on the most economical basis. A wide diversity of wants is met for the maintenance of the convict labor camps, some of the major items purchased yearly being as follows: groceries, $150,000; clothing, approximately $25,000; and tobacco, from $8,000 to $9,000. These items are charged to the prisoners and paid for by them out of their daily wage allowance.

The Purchasing Department keeps in close touch with all other departments of the commission, including the Construction Department, Maintenance Department and the Accounting Department. In the expenditure of such large sums of money, it is of course necessary that the greatest care be exercised on every purchase, and contact with the various departments aids this department in making its purchases on the most economical basis possible. Close relationship to other departments, as outlined above, gives the purchasing agent a better insight into the needs of all phases of the Commission's work.

Competitive Bidding the Rule.

Competitive bids are always asked, except for such items as repair parts for machinery where competition can not be had, and in some cases of minor supplies and occasional emergency where delay would be detrimental to the progress of the work. Purchases without competition are kept at a minimum.

The Purchasing Department keeps a complete, current set of railroad tariffs, and checks all freight bills, as well as prices and terms on all invoices covered by purchase orders. The number of such orders issued yearly to handle the requirements of the California Highway Commission approximates 20,000.

Costs of road construction materials are furnished to the Engineering Department for use in preparing estimates of cost of proposed construction work.

In addition to the purchasing the department also handles the sale of surplus, obsolete and junk equipment and supplies.

The work is handled by the purchasing agent, assistant purchasing agent, a clerk and from three to five stenographers.

BIENNIAL REPORT READY SOON

The Biennial Report of the California Highway Commission, covering the fiscal period June 30, 1922, to June 30, 1924, has been filed with Governor Friend Wm. Richardson and printed copies will be off the press about January 1st. The statement of State Highway Engineer R. M. Morton to the commission forms a part of the report, which also contains financial and other data covering state highway construction from date of the first bond issue.

Motor Cop—"Hey, where are you going? Don't you know this is a one way street?"

Abe (in new car)—"Vell, I'm only going von vay, ain't I?"

Recently a rancher of Sonoma County requested from Division IV a permit to install a 15 corrugated metal pipe under the driveway leading to his ranch house. The rancher, however, failed to put the inch mark after the 15.

One of the division's fair stenographers in reading the request preparatory to writing the permit gained a rather different impression, whereupon she informed the division engineer:

"I have a request for a permit for fifteen corrugated metal culverts under a driveway—that sure is some driveway, isn't it."

We'll say that's *some* driveway.

ALONG THE SOUTHERN COAST—View of the state highway north of Santa Monica, Los Angeles County, a part of the Oxnard-San Juan Capistrano route. This wonderfully scenic road is planned to relieve traffic in the congested section around Los Angeles. Its construction is going steadily forward.

Gasoline Tax to Make Possible Improved Sacramento Entrance

THE fruition of a long cherished hope for an improved highway entrance on the north is about to be realized by Sacramento. Thanks to the last legislature for the passage of the gasoline tax law, the State Highway Commission is in a position to announce that construction will be undertaken in the near future on the subways under the tracks of the Sacramento Northern and Western Pacific railways. A ground level road will follow and the present dilapidated wooden trestle will be removed.

Proceedings initiated by the highway commission before the State Railroad Commission resulted in a decision assessing 50 per cent of the cost against the railroads. The Western Pacific Company has petitioned for a rehearing, but a stipulation has been signed with the commission which will permit the work to go ahead.

Plans Now Under Way.

The bridge department is now preparing plans for 90-foot steel girder skew spans and approaches to be placed on concrete bents. These spans will provide a clear roadway width beneath the railroads of thirty feet for the present, but the work will be done in such a way that an additional thirty-foot roadway may be built at a later date, if required by traffic.

Final plans for a ground level pavement have not yet been approved by the State Highway Engineer, but will be ready by the time the underpasses are completed. Construction of such a road has been approved by the State Reclamation Board.

In case of high water in the flood channel of the American River, which is crossed by the present wooden trestle, arrangements have been made with Sacramento County for the improvement and rebuilding of a section of the trestle leading to the Natomas boulevard which will provide an alternate route, via El Camino Avenue, into North Sacramento.

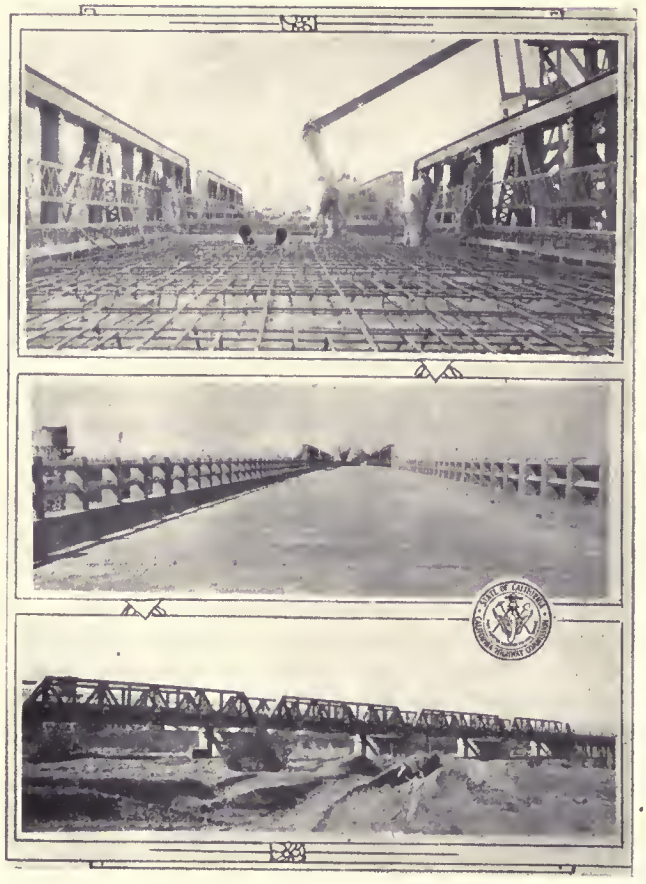
Will be Gasoline Tax Job.

In line with further improvements on the northern entrance to Sacramento, surveys have been made and studies are now under way for the elimination of the Ben Ali grade crossing on the Southern Pacific railroad. It is hoped construction of an underpass in this vicinity may be undertaken in the near future.

Elimination of present intolerable conditions at the northern approach to Sacramento has been the subject of years of study upon the part of engineers of the highway commission and a determined effort looking to its solution has been made in recent months. Receipts from the gasoline tax have made possible financing of the project. These funds are being devoted by the highway commission to such improvements, and for widening and thickening of previously constructed highways in many sections of the state.

The Pace That Kills.

First Hunter—"Killed anything?"
Second Hunter—"Not a thing! Wish I'd gone motoring now."—*Bystander* (London).



STONY CREEK BRIDGE—New structure on the Chico-Orland state highway in Glenn County, recently completed. Views show pouring of the concrete floor and sections of the completed bridge, which is a combination of steel and concrete.

THE CUYAMA FOREST HIGHWAY

ABOUT six and one-half miles of the Cuyama state lateral, connecting the San Joaquin Valley at Bakersfield with the Coast highway near Santa Maria, is within the Santa Barbara National Forest. The section within the forest, together with approximately nine and one-half miles approaching it from both ends, is being constructed under the supervision of the United States Bureau of Public Roads with forest highway funds and cooperative funds supplied by the State Highway Commission and the Cuyama joint highway district.

The contractor, reports Division V, has been working three shovels in a vigorous attempt to complete the fifteen miles now under way within the year. However, due to considerable hard rock encountered, it is evident the work will extend well into next year.

Counties to Complete Work.

The construction is reached from a point on the Coast highway near Santa Maria by approximately eighteen miles of state highway of the gravel type, built by the highway commission and the Bureau of Public Roads.

On the east, thirty-seven miles will connect the portion now under construction with the improved highway at the Kern County boundary. This unit is to be graded by Santa Barbara, San Luis Obispo and Kern counties, jointly.

"It costs more to go without roads than to build them."—*Thomas H. MacDonald,* Chief of U. S. Bureau of Public Roads.

"What I Got Out of the San Francisco Meeting"

(Continued from page 7.)

highways to meet the needs of transportation evidenced by officials and engineers from all parts of the country. The papers and discussions provided much food for thought and action which should lead to highway development that will serve the needs of the nation as a whole, rather than a few of the wealthiest states. The outline of the policies of the Bureau of Public Roads in its cooperation with state highway departments, as outlined by Mr. MacDonald, gave me a better appreciation of the work of the Bureau than I have heretofore had.

The address on the Wendover Cut Off, by Howard C. Means of Utah, brought a realization that others have difficult problems to face, which makes ours seem less difficult. An interesting point brought out in connection with the discussion of eastern traffic surveys was the fact that some motor transportation companies engaged in making long-distance hauls have found that they can not compete with the railroads and are going out of business.

The statement of R. W. Crum, Material and Testing Engineer of Iowa, to the effect that unit bids are not appreciably increased by requiring contractors to install scales for weighing concrete aggregates was rather surprising.

L. H. GIBSON, Division Engineer, San Luis Obispo—I was particularly impressed by the spirit which brought those attending the convention together in an effort to work out the many problems of highway construction confronting the country. The personal benefit derived was from the inspiration gained in meeting and hearing highway engineers and officials of national reputation. They are leaders in a project of great magnitude and it is a pleasure to work for and with them.

J. B. WOODSON, Division Engineer, Fresno—The acquaintanceship and comparison of ideas was the big thing I got out of the San Francisco convention. Dr. Hewes' paper on Mountain Road Construction illustrated the advancement in highway development to keep pace with increasing traffic. I also discussed the Yosemite road construction problem with Stephen T. Mather, Director of National Parks, and soils and concrete construction with Mr. A. T. Goldbeck of the Bureau of Public Roads. The two-day trip to Los Angeles with the visiting engineers gave further opportunity for comparison of ideas.

S. V. CORTELYOU, Division Engineer, Los Angeles—The interesting and instructive papers presented the latest ideas and practices in highway construction and maintenance. This, and the personal contact and exchange of views with leading highway engineers and officials of the whole country, made the San Francisco convention very helpful and enjoyable.

Mr. Winslow and myself had an interview with Mr. A. T. Goldbeck, chief of tests of the Bureau of Public Roads, on an important problem in this division—the cracking of reinforced concrete near the ocean. Mr. Goldbeck gladly furnished us information regarding investigations of this problem in other parts of the country which may be of considerable value to California. This is but one of several interviews of this kind.

E. Q. SULLIVAN, Division Engineer, San Bernardino—It is one thing to read engineering reports and another to hear papers presented by the men who have been doing the work and making the investigations. The San Francisco convention convinced me we should attempt to carry out proven refinements instead of considering them in the abstract and keeping on in the same old rut. I am thinking particularly of improvements in methods of testing of materials for concrete and the proportioning of aggregates, also the newer ideas in specifications for high quality of construction.

I came away from San Francisco with a feeling of enthusiasm, convinced that the road builders of the country are earnest and self-sacrificing in their efforts to serve the public. I was proud of the showing made by our own organization.

F. G. SOMNER, Division Engineer, Bishop—The San Francisco convention told the whole story of highway building in America, every phase of which was discussed in a comprehensive and masterful fashion. The construction of the Wendover Cut Off, the discussion of traffic laws for public safety, and problems in mountain road construction were among the features with which I was particularly impressed. The discussions of highway research and highway transport were a credit to the engineering profession. The division engineers are indeed fortunate in having this opportunity for contact with such eminent authorities in the field of highway building.

J. C. McLEOD, Division Engineer, Sacramento—So much information of value was presented in the various papers that I am awaiting their publication to more fully digest them. This is particularly true of the paper presented by Mr. MacDonald, and the several papers presented with regard to highway research and construction of pavements, particularly those of J. Gordon McKay and R. W. Crum. The impression I had following the presentation of Mr. A. T. Goldbeck's paper was that California is abreast of the best known methods of other states. Many of Mr. Goldbeck's conclusions are borne out by practical application in our own organization.

I am also convinced that we should put into practice some plan for marking state highways to designate them from county roads as suggested at the meeting.

COOPERATION APPRECIATED.

The thanks of the department are due the Automobile Club of Southern California and the State Motor Vehicle Department for their cooperation in making the motor trip of the visiting highway engineers from San Francisco to Los Angeles a big success. The club furnished two machines with drivers and the caravan was accompanied all the way to Los Angeles by an escort of motorcycle police.

Equipment Engineer R. H. Stalnaker had charge of arrangements.

The Department of Convict Road Camps, shortly before Christmas, distributed $2,391.26 to the dependents of 107 of the prisoners working in the three camps. The money is a part of the earnings of the men and is paid to their families upon their order.

She'd Tell Him.

It was the dear old lady's first ride in a taxi, and she watched with growing alarm as the driver continually put his hand outside the car as a signal to the traffic following. At last she became exasperated.

"Young man," she said, "you look after that car of yours and watch where you're driving. I'll tell you when it starts raining."—*The Tappet.*

WHAT THE DIVISIONS ARE DOING

DIVISION I CLEARS SLIDES CAUSED BY UNPRECEDENTED RAIN STORMS

UNPRECEDENTED rain storms in Division I have caused considerable damage in Del Norte and Humboldt counties and in northern Mendocino County. The roadway has been blocked for short periods by slides, one of which, a few miles south of Crescent City, required a power shovel to open the road.

J. F. Knapp, contractor, is continuing the Eureka-Arcata paving whenever weather permits. A twenty-foot concrete pavement is being placed in accordance with the latest specifications of the State Highway Engineer.

DIVISION II NOW LOCATED IN NEW HEADQUARTERS AT REDDING

THE engineering and office forces of Division II are now located in the new division headquarters in Redding, the move from Dunsmuir having been completed early in December. The new headquarters office was planned by the state architect with the needs of the division particularly in mind. New shops also have been erected. The site for the building and shops was a gift to the state from the Redding Chamber of Commerce.

Division II has graders and snow plows located at five different points in the division and maintenance forces are prepared to battle snow on the main trunk line to Oregon in the vicinity of Weed; between Burney and Fall River Mills on the Alturas lateral; between Alturas and Cedarville; Buckhorn grade, Redding to Weaverville; and between Susanville and Westwood in Lassen County.

The oil macadam and gravel surfacing contract of Polk and Polk, east of Susanville, Lassen County, has been completed and the equipment moved out. The same applied to the gravel surfacing contract of Warren Brothers on 9.7 miles between Janesville and Milford in the same county.

Contract Ahead of Schedule.

The grading contract of the Nevada Contracting Company, on the Pacific Highway between Bayha and Halfway Creek, was practically complete more than a month ahead of the time limit. Early in December, removal of a few slides and the placing of 9000 cubic yards of rock surfacing was all that remained to be done except for some shoulder work and general finishing up of the job. The time limit expires February 5th.

Steady progress on the extension of the Dunn and Baker contract is noted. Two power shovels are operating and placing of crushed gravel is progressing as fast as the grading permits, with considerable benefit to traffic.

A cable line, placed in anticipation of a washout, is handling mail, freight, and passengers at Cedar Flat where a temporary bridge on the Trinity River highway was carried away during recent high water. It is probable the structure will not be replaced until next summer.

MAINTENANCE IS NOW UNDER WAY ON MANY DIVISION III ROUTES

A BIG program of maintenance activities is now under way on several routes in Division III. Extensive grading and shaping of shoulders has been undertaken on the Eastside highway between Lincoln and Sheridan, Placer County.

Between Williams and Colusa, 7.4 miles of gravel shoulders are being placed with an allotment of $9,625.

Superintendent W. H. Miller is in charge of an extensive program of culvert extension on the trunk lines through the Sacramento Valley and on several lateral highways. As fast as the culverts are lengthened, guard rails are removed and the appearance of the highway thereby greatly improved. The allotment for this work is $9,956.

Bridge Approaches Finished.

Grading of approaches to the Stony Creek bridge on the Chico-Orland lateral has been completed and state forces are now engaged in grading sections of the highway to connect with the present county road.

Repairing of bridges at Bowman, Placer County, and grading of approaches has been completed.

Grading of 0.9 of a mile of the highway between Tahoe City and the Nevada line has been completed and a rock crushing plant for the production of surfacing material is now under construction at Carnelian Bay.

Snow Gauges Erected.

Snow guages have been installed on several highway routes in Division III in the Sierra Nevada mountains. These gauges consist of 4-inch by 4-inch by 12-foot posts marked to feet and inches. They have been erected outside of drift areas at the following locations:

Riverton, Phillips, Echo Summit, Comptonville, Indian Hill, Downieville, Yuba Pass, Cisco, Donner Summit, Donner Lake, Truckee, summit of the Dog Valley grade, Tahoe City, Boca, Floriston, and Calvada station, and at several locations on the Nevada-California border.

Keeping of a systematic snow record will have a definite value in the determination of future types of road construction and in making plans for organized snow removal when traffic warrants the expenditure.

Tractors Prove Economical.

Division III, this season, is using 30-horsepower tractors for the operation of graders on valley grading and shoulder work instead of the trucks heretofore used in maintenance activities. The tractors are proving more economical in operation and better results are being obtained.

Good progress is reported on the grading contracts under way between Auburn and the Nevada line. Conditions so far are favorable to a continuation of the work throughout the winter.

Wet weather has delayed the completion of the asphalt concrete job on the Chico-Orland lateral in Butte County.

CONSTRUCTION ON BAY SHORE HIGHWAY INTERESTS PUBLIC

WIDESPREAD public interest in the Bay Shore highway, a section of which is now under construction in the vicinity of South San Francisco, is reported by Division IV. Contractor A. D. Foley is rushing work on the tide gates with the expectation that they will be finished before winter storms. A dredger and steam shovel are working to capacity in the building of the grade across the tide flats.

Contractor J. P. Holland is making excellent progress on the Skyline boulevard between the Kings Mountain and the La Honda road. Another section of this highway has been opened to traffic between Sloat boulevard and the Kings Mountain road where the Skyline boulevard intersects the county highway to Woodside and Redwood City.

Widening Jobs Completed.

Traffic over Altamont Pass has been greatly facilitated by the widening of the state highway between Greenville and Livermore, in Alameda County. This improvement was made possible by the use of gasoline tax funds.

Freeman and Whiting have about completed their contract for the widening of the Peninsula highway between Redwood City and the southerly boundary of San Mateo County. This is also a gasoline tax job.

Park Widening Resumed.

State forces have resumed the work of widening the highway between Boulder Creek and the California Redwood Park in Santa Cruz County. A three-quarter yard Northwest gasoline shovel is being used to excavate embankments and improve alignment. The recent good weather has permitted the work to progress faster than expected. Surfacing of the new grade with rock will be started shortly.

Bridges built by Sonoma County over Calabazas Creek and Stuart Creek, on the Beltane-Schellville section of the highway, have been completed and opened to traffic.

BIG JAHN AND BRESSI CONTRACT IN SAN DIEGO IS COMPLETED

THE big Jahn and Bressi contract for the widening and thickening of 17.14 miles of the Coast highway in San Diego County, Division VII, has been completed and the new highway opened to traffic. Placing of concrete was finished several weeks ago and

DIVISION ACTIVITIES

shaping of shoulders was completed during the present month. This is one of the largest gasoline tax jobs to date and represents an expenditure of approximately $533,000.

A 48-inch reinforced concrete pipe storm drain to relieve flood conditions on the Whittier boulevard at Workman Mills is being installed in accordance with the Los Angeles County plan for flood control.

With the camp established near Winter Canyon, the day labor crew on the Malibu Ranch is "plugging away" moving dirt and installing culverts.

Paving Completed.

The completion of the new bridge across Santa Ana River, now under construction by Orange County, will open for traffic the new concrete pavement between Huntington Beach and Newport. Placing of concrete on this structure is now in progress.

Placing of concrete has been completed on the new pavement between Huntington Beach and Corona Del Mar, another important job in Division VII. Shoulders are being shaped. A hydraulic fill near the north arm of Newport Bay will not be paved until time has elapsed for settlement. This is an important unit of the highway along the southern coast.

Grading Progresses.

Installation of culverts is progressing rapidly on the W. D. McCray contract at Laguna Beach on the Coast boulevard. Two power shovels and a fleet of trucks are engaged in the grading work.

Two large culverts near Irvine, Orange County, have been completed by a special day labor force in charge of Superintendent A. W. Schmuck. They form a part of the program to improve the cross county drainage. Adjacent owners are constructing connecting ditches.

Paving of fills on the Jahn and Bressi contract with oil macadam pending settlement has been completed by a special day labor force.

DIVISION VIII STARTS WORK ON MECCA-BLYTHE HIGHWAY

UNDER the general direction of Maintenance Engineer J. E. Stanton, Division VIII has started work on the improvement of the Mecca-Blythe highway between Shavers Well and Blythe, in Riverside County. Methods which proved successful on the Barstow-Needles route are being followed in the improvement of the new highway across the desert which is a part of a Los Angeles-Phoenix route.

Several small tractors have been purchased and grading operations started at several locations. W. E. Tedford, formerly foreman at Ludlow, has been placed in charge, with headquarters at Shavers Well.

Yuma Plans Celebration.

Division VIII is looking forward to the completion of the highway between the Sand Hills and the Colorado River at Yuma. Citizens of the Arizona city are planning to celebrate the event.

Work is progressing on the graveling of the state highway through the main street of the town of Westmoreland, Imperial County, which is being done by state forces. H. S. Payson is resident engineer in charge.

IMPORTANT WIDENING AND THICKENING WORK COMPLETED IN DIVISION X

COMPLETION of contracts is rapidly adding to the mileage of splendid new highways in Division X.

The Valley Paving Company has completed the widening and thickening of eight miles on the Stockton-Oakland route in western San Joaquin County. The pavement has been widened to twenty feet and thickened with asphalt concrete. Vialog tests show a satisfactory smoothness of surface. The work was done with gas tax funds.

Another widening job in Division X which has been completed is the flush concrete shoulder contract of four miles between Rockville and Fairfield, Solano County. The work included crushed rock shoulders at the side of the pavement. Safety of travel on this section has been improved greatly by the added width.

Contractors Rush Paving.

The asphalt concrete widening job of Force and Currigan, between Vacaville and Batavia, Solano County, another gasoline tax job, is rapidly nearing completion and with reasonably good weather will be finished by the time this is in print. The placing of an average of 300 tons of asphaltic concrete mixture per day has been maintained during recent weeks.

Grading on the Rio Vista lateral between Denverton and Suisun, Solano County, is progressing rapidly. The county has started work on the surfacing in accordance with its agreement with the highway commission. The latter work is in charge of County Surveyor F. A. Steiger.

The new fog signal on the bridge at Rio Vista was officially placed in operation December 1st.

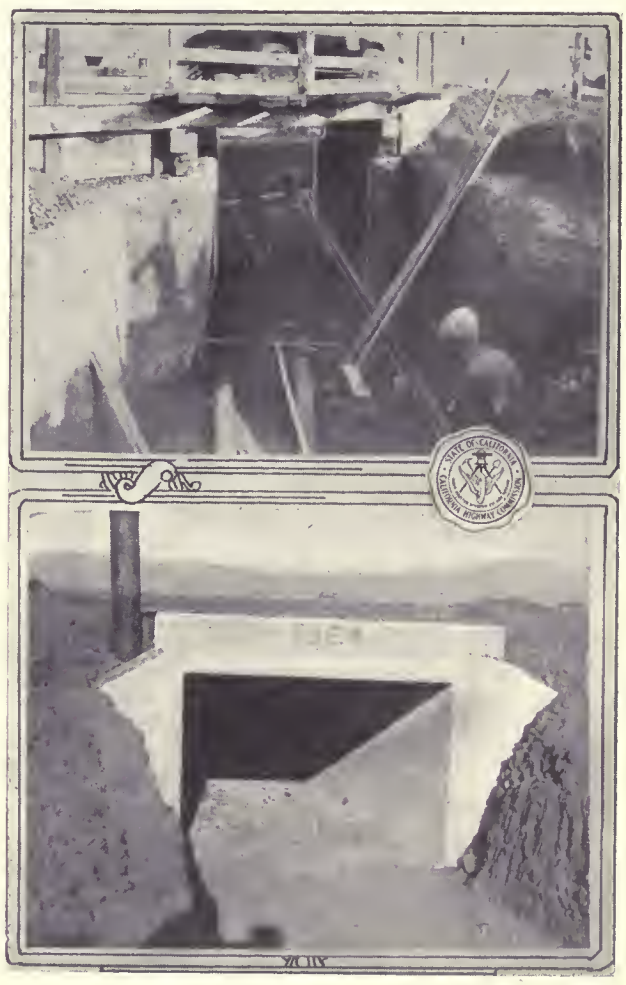
The roadway on the high fill between Mossdale and Banta on the French Camp-Tracy section of the highway, San Joaquin County, is being made safer by the placing of guard posts on the shoulders similar to those placed on the Stockton-French Camp road.

Maintenance crews on the mountain roads in Division X are engaged in placing gravel and making other improvements in anticipation of next season's travel.

County Secures Rights of Way.

Amador County has secured necessary rights of way for the highway between Central House and Drytown and it is expected state forces shortly will be authorized to start work on the approaches to the Dry Creek bridge. The fills will be rip-rapped to provide protection from flood waters. The bridge, which is being built under county contract, is nearing completion.

A new deck is being placed on a wooden trestle a short distance south of Thornton on the Lodi-Rio Vista lateral.



IMPROVING DRAINAGE—Large culvert constructed near Irvine, Orange County, to assist the completion of a cross-county drainage system. The upper view shows traffic using the highway unhampered by the construction under way.

HARLAN D. MILLER APPOINTED BRIDGE ENGINEER

THE APPOINTMENT of Harlan D. Miller to the position of bridge engineer of the highway department, effective as of November 1st, is announced by Mr. Morton. The new head of the bridge department succeeds H. E. Warrington, who resigned early in the year.

HARLAN D. MILLER

Mr. Miller has been engaged in engineering work for nineteen years. He formerly was connected with the bridge department of the New York Central railroad and held a similar position with the state of New York.

Mr. Miller assumed the position of acting bridge engineer a year ago, at the time all bridge work was transferred from the divisions to headquarters and placed under a centralized department. The department has been considerably enlarged under his direction.

The new bridge engineer is a graduate of the Case School of Applied Science in Cleveland, Ohio, where he was elected a member of the Sigma Xi, the scientific honor society. He has been with the California Highway Commission for five years.

BRIDGE DEPARTMENT NEWS

THE J. H. Tillman Company has installed extensive facilities for handling construction at the Ventura Seawall and it is expected work will be under way by the time this is in print. A standard guage railroad spur has been installed and also an industrial railroad. Although the work is somewhat behind schedule, the contractor is sparing no expense to insure the work progressing rapidly when a start is made.

The rock crushing and screening plant will produce over 200 cubic yards of aggregates per day and the central mixing plant has a capacity of 400 cubic yards of concrete per day. However, it is planned to operate the mixer a half day at a time, placing about 200 yards of concrete in the seawall. The disposition of the concrete from the mixer to the forms will be handled by the industrial railroad.

Dingle With Bridge Department.

C. O. Dingle, resident engineer, formerly with Divisions III and X, is now with the bridge department. He has been assigned to the Simmons Creek Bridge in San Luis Obispo County. C. C. Gildersleeve has been awarded the contract.

Construction of the bridges near Bieber, in Lassen County, has been shut down for the winter.

A large concrete arch culvert is being constructed at Sycamore Creek in San Diego County, north of Oceanside. H. H. Peterson is the contractor.

Floods Delay Northern Projects.

The work at the Douglas Memorial Bridge across the Klamath River in Del Norte County has been held up on account of high water. F. Rolandi, the contractor, lost considerable false work in the recent floods.

Work at the Van Duzen River Rridge, in Humboldt County, also has been a battle with the elements during the last month. The river rose a second time and carried away the falsework from under the arches. Fortunately, the keys had been in place for some time and no damage to the structure resulted. Finishing work, however, will be delayed for some time.

COMMENT ON MAINTENANCE ACTIVITIES

THE Marysville Appeal declares Maintenance Foreman William Reynolds has earned the title of "Safety First Bill" by his improvement of the state highway between Roseville and Marysville. Shoulders have been widened and guide lines painted in the center of curves and bridges.

The editor of the Placerville Democrat comments favorably upon the work being done between Placerville and Folsom. Rebuilding of shoulders and widening of curves is under way. H. L. Montefort is in charge.

A trip over the Fall River Mills-Burney section of the Alturas lateral was made recently by the editor of the Fall River Tidings, who declared he was surprised at the amount of work accomplished. He declares those who use the road appreciate the efforts of Maintenance Engineer F. J. Gribble.

NEW SEAL ADOPTED

CONSIDERABLE interest has been manifested throughout the department in the new seal of the California Highway Commission, which has been in use for a number of months. The new design was made necessary by the separation of the highway commission from the department of public works, authorized by an act of the last legislature.

For the first time, the commission now has an individual seal. It was designed by E. M. Muse, of the staff of the testing laboratory, who was awarded the $25 prize offered by State Highway Engineer R. M. Morton. A number of designs were entered in a competition, open to all engineers of the department.

The transit is the dominant symbol and typifies Science, Mr. Muse explains. The pick and shovel represent Labor and the winged wheel Transportation and Speed.

The Latin slogan: *"Robur directum Scientia est via fortunae,"* is translated, "Energy directed by Science is the highway to prosperity."

Same Story Everywhere.

"In placing before you this, my fifth annual statement of the activities of the Public Works Department, I desire at the outset to emphasize the fact that if more money could reasonably be placed at my disposal, works in hand could be finished in less time, and others, which can not now be commenced, might be added to the year's program of work."—From the 1924 report of the Minister of Public Works of New Zealand.

NO, THEY'RE NOT CROSS-WORD PUZZLES.

Down on the Peninsula highway, south of San Francisco, the Maintenance Department is making a study of the position traffic takes on the highway. Numerous numbered lines are painted on the pavement to assist in taking a count of the number of vehicles passing over a given section.

The maintenance man in charge was somewhat provoked when a woman motorist stopped and asked him if he were working out the cross-word puzzle on the highway.

CALIFORNIA HIGHWAYS

OFFICIAL PUBLICATION OF THE

CALIFORNIA HIGHWAY COMMISSION

SACRAMENTO, CALIFORNIA

HARVEY M. TOY, Chairman;
N. T. EDWARDS and LOUIS EVERDING, Commissioners.

ROBERT M. MORTON, State Highway Engineer.

W. F. MIXON, Secretary.

We are pleased to permit publication of any of the matter contained herein or to loan cuts and this privilege is extended newspapers and periodicals without restrictions.

FRANK B. DURKEE - - - Editor
P. O. Box 1103, Sacramento, California.

Vol. 1. DECEMBER, 1924 No. 12

JUST AMONG OURSELVES

☆ ☆ ☆

HIGHWAY NEWS NOTES

Turkey Dinner for Division II.

A FAREWELL to the office force of Division II was arranged by the Lions Club of Dunsmuir just before the departure for the new division headquarters in Redding. A turkey dinner was served at the Hotel Weed as an expression of the good will of the club members. Division employees declared they were leaving Dunsmuir, its accommodating business men, wonderful scenery and the "best water on earth," with keen regret.

Mrs. M'Dell Payne enjoyed a visit of a few days recently in San Francisco.

Mrs. A. M. Mitchell and Miss Josie Paul, of the Division II force, visited in Sacramento over Thanksgiving.

A. F. Ager, draftsman, has returned to Redding after a vacation in San Juan and San Francisco.

Equipment Superintendent W. A. Smith of Division IV recently was presented with a set of golf clubs by friends in Sacramento.

Resident Engineer Transferred.

H. C. Reeder, resident engineer on the recently completed Whittier boulevard paving contract, has been transferred to the new Sycamore Creek bridge in San Diego County.

Started on One of Sullivan's Picnics.

A romance which had its beginning beneath the desert moon on one of the Division VIII picnics has resulted in wedding bells for Miss Lillian Bollong, clerk in the accounting department at San Bernardino. The man in the case is Mr. Ralph Wright, formerly of the drafting department. Division Engineer Sullivan reports this is the third romance in the division since it was established a short while ago.

The marriage of Earnest R. Samson, maintenance foreman at Beaumont, and Miss Pearl Viola Kohler, daughter of Mr. and Mrs. Henry F. Kohler, was announced recently.

L. W. Aldrich, Division VIII draftsman, has returned from a vacation in Los Angeles.

C. B. Boyce, formerly maintenance foreman at Victorville, has been transferred to Waterman Canyon.

Miss Edith Miller, stenographer, W. E. Prather, senior clerk, and Mrs. Leah Wagner, stenographer, are among members of the San Bernardino staff who have returned from vacations.

Mrs. E. E. Fifield, of Division X, enjoyed a vacation recently, visiting in the Bay cities.

Some More Proud Daddys.

A baby daughter, weighing almost nine pounds, recently put in an appearance at the home of R. W. McCrea, draftsman with Division X, and formerly of the Division III office.

Recent weeks also brought a daughter to the home of Mr. and Mrs. Carl F. Heintze. The new daddy was formerly assistant division engineer in Division III.

Smith Attends Convention.

Lowell R. Smith, purchasing agent of the department, attended the annual convention of State, County and Municipal Purchasing Agents held in Oakland early in the month. Matters relating to economic public buying were discussed and valuable information gained from contact with others having similar problems. Smith reports a tour of Oakland manufacturing plants, arranged by the Oakland Chamber of Commerce, highly instructive.

Bridge Men Honor Miller.

In honor of his promotion, engineers of the bridge department and their families recently tendered Mr. Miller a little surprise in the way of a dancing party at the Municipal Clubhouse at Sixteenth and C streets. During the evening the department staff presented their chief with a handsome Sigma Xi pin to replace the one he had lost several weeks previously.

On the trip south over the El Camino Real, a member of the visiting party of engineers was heard to remark: "This is nearer Heaven than I ever expected to be."

At a rodeo held recently "east of the high Sierras," a son of Erin, just over, was induced to mount a notorious bucking mule. Pat held tenaciously to the pommel and bucking straps, at every jump exclaiming, "Be jabers and you'll not get me off." Finally the mule in its frantic efforts to unseat the Irishman got its hind feet mixed up with the stirrups, which Pat had lost early in the game. "Be gorra," says Pat, "if you're going to get on, I'm going to get off."

Not Likely.

Jimmy, aged five, was being prepared for bed. Mother hunted high and low, but nowhere could she find a nightgown.

"Well, Jimmy," she said, "you'll have to wear your sister's just for tonight."

Jimmy drew himself up haughtily.

"What?" he asked in astonishment. "Wear a girl's?"

"Yes; why not?"

"I won't wear a girl's nightgown," said Jimmy, indignantly. "I'd rather go to bed raw."—*The National Mason.*

VISITORS GREETED.

The families of highway officials and engineers on their way to the San Francisco convention were greeted upon their arrival in Sacramento by a delegation of the headquarters engineers and their wives. The Sacramento women coupled a personal word of greeting with bouquets of violets. Among those assisting in the distribution were: Mesdames T. E. Stanton, Fred J. Grumm, Harlan D. Miller, R. E. Pierce, J. C. McLeod, L. V. Campbell, W. F. Faustman, F. W. Haselwood, C. S. Pope, and G. R. Winslow.

DIVISIONS MAILING BULLETIN

THE mailing of the Bulletin to engineers and staff and maintenance employees, exclusive of the Sacramento headquarters, has been placed in charge of the several divisions. Sufficient bulletins are shipped each month directly to the headquarters of the ten divisions to be redistributed.

Frequent changes in address of the men in the field made it difficult to keep the Sacramento mailing list up to date. In the future, those who do not receive the bulletin promptly should immediately call the matter to the attention of the division engineer.

Seattle Public Library

The map above does not show all of the state highways in California but only those included in the federal aid system, representing approximately 7 per cent of the total road mileage of the state, outside of cities.

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FRANK J. SMITH, Superintendent
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CALIFORNIA HIGHWAYS

OFFICIAL PUBLICATION OF THE CALIFORNIA HIGHWAY COMMISSION

Vol. 2 JANUARY, 1925 No. 1

MAKING THE HIGHWAYS SAFE—AERIAL PHOTOGRAPH OF GRADE CROSSING ELIMINATIONS ON THE SAN DIEGO COAST—The new pavement between Encinitas and Cardiff has been constructed on the west side of the Santa Fe railroad. doing away with both crossings and reducing the number of curves from eleven to four and lowering the maximum grade from 7.10 per cent to 4.75 per cent. Distance shortened 350 feet. A gasoline tax job. (Div. VII.) Photo by U. S. Air Service.

In this issue: APATHY MUST NOT DEFEAT THE COLTON BILL—AIRPLANE VIEWS OF LINE REVISIONS ON THE SAN DIEGO COAST—EXPERIMENTS WITH HYGROSCOPIC SALTS AS DUST PREVENTIVES.

California Highway Department

California Highway Commission

HARVEY M. TOY, Chairman, San Francisco

N. T. EDWARDS, Commissioner, Orange — LOUIS EVERDING, Commissioner, Arcata

R. M. MORTON, State Highway Engineer, Sacramento

PAUL F. FRATESSA, Attorney, San Francisco — W. F. MIXON, Secretary, Woodland

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C. S. POPE, Construction Engineer — G. R. WINSLOW, Maintenance Engineer

HARLAN D. MILLER, Bridge Engineer — R. H. STALNAKER, Equipment Engineer

L. V. CAMPBELL, Office Engineer

BEN H. MILLIKEN, Superintendent of Convict Road Camps

HERMAN B. WEAVER, Chief Accountant — LOWELL R. SMITH, Purchasing Agent

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H. S. COMLY, Division II, Redding

F. W. HASELWOOD (Acting), Division III, Sacramento

J. H. SKEGGS, Division IV, San Francisco

L. H. GIBSON, Division V, San Luis Obispo

J. B. WOODSON, Division VI, Fresno

S. V. CORTELYOU, Division VII, Los Angeles

E. Q. SULLIVAN (Acting), Division VIII, San Bernardino

F. G. SOMNER, Division IX, Bishop

J. C. McLEOD, Division X, Sacramento

General Headquarters, Fifth Floor, Forum Building, Sacramento

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JANUARY 1925 | California Highways | VOL. 2 No. 1

Apathy Must Not Defeat the Colton Bill

By HARVEY M. TOY, Chairman, California Highway Commission.

PASSAGE by congress of the Colton bill will be the greatest forward step in road building in the United States since the authorization of the seven per cent system.

I am convinced congress is ready to enact this measure, with its 100 per cent federal aid for public land states, vitally important to the west, and its repeal of the per mile limitation of the present law, of great benefit to every state.

There is no substantial opposition. If the Colton bill dies in committee it will be because of the apathy of its friends, not the opposition of the few who may be opposed.

Other necessary federal aid highway legislation is practically certain of passage of this session; the Colton bill is still in committee at this writing. There is yet time to get it out and through congress, if every state highway department in this Union will make known in Washington the demand for this legislation. Congress will respond to the public need but that need must be made evident.

The states represented at the San Francisco convention voted unanimously an endorsement of the Colton bill. Let us stand together and see that it is enacted into law before next March.

Highway building is moving forward. Its course and the underlying plan must be as sound and practicable as possible. To this end, the Colton bill is the opportunity of the road builders of the nation.

Legislatures are now in session, governors should urge them to appeal to the congress. Let civic organizations join with highway departments in pressing for action at this session.

This is not alone the problem of the west, it is the problem of all the states. A truly national system of highways can never become an accomplished fact without united action by all sections of the country.

Eastern engineers and officials, who viewed western conditions last November, need not be convinced of the necessity of 100 per cent federal aid for highways through arid public lands. They should need no urging in the matter of the repeal of the per mile limitation, inconsistent as it is with the whole scheme of federal aid and not justified by conditions as they exist today.

Demand action by this congress. *Apathy must not defeat the Colton bill.*

LINE AND GRADE CHANGES IMPORTANT FACTORS IN RECONSTRUCTION OF SOUTHERN HIGHWAY

By A. N. GEORGE, Resident Engineer.

LINE and grade changes, eliminating bad curves, railroad crossings and other hazards, make the Jahn and Bressi contract, on the Coast boulevard between San Diego and Oceanside, one of the outstanding reconstruction projects completed on the state highway system during 1924. It was financed with gasoline tax and motor vehicle revenues.

The original pavement was among the first provided for by the California Highway Commission and was placed in 1912 and 1913 on a grade previously located and improved by the San Diego County Highway Commission. Viewed by present-day standards and the necessities of traffic, portions of both alignment and grade were poor.

The old pavement was but fifteen feet wide and four inches thick of a 1:2½:5 concrete mix.

A "Second Story" Job.

Heavy and constantly increasing traffic made improvement necessary and the project was undertaken as one of the first reconstruction contracts of the 1924 season. The new work included widening the old pavement to twenty feet with a "second story" of concrete where the old base was badly broken and with flush concrete shoulders where the original pavement was in good condition.

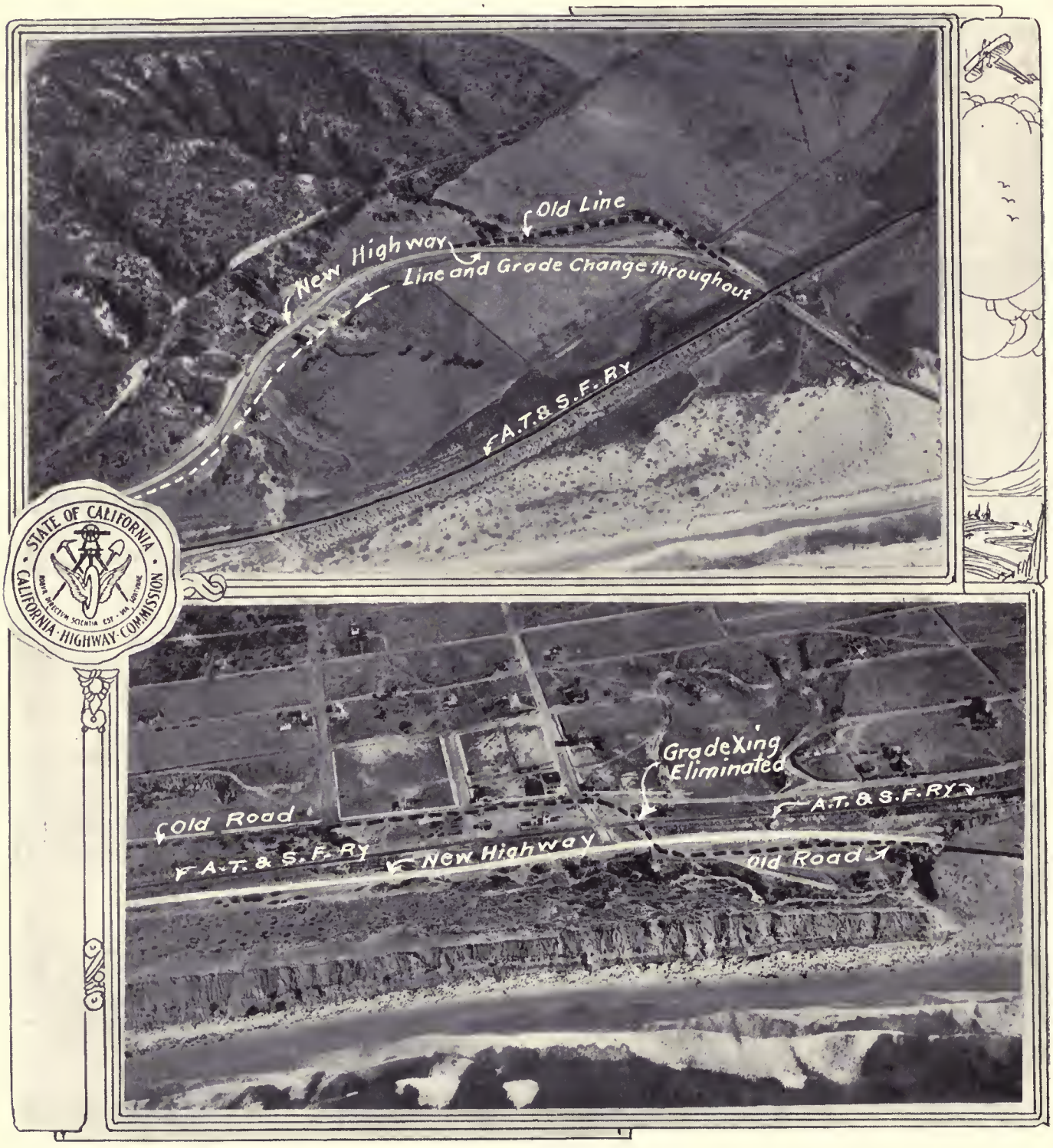
Surveys had been made at the time of letting the contract for some of the proposed line changes, but as plans and rights-of-way for these were not completed they were excluded from the agreement. As fast as plans could be completed and rights-of-way secured, these exceptions were included in the contract. Numerous additional line and grade changes also were made which were not contemplated at the time the contract was let.

More Grade Separations Planned.

In a distance of eight miles, seven miles were built on either new alignment or new grade. Two grade crossings were eliminated and plans are being prepared for the separation of grades at two other points where gaps were left in the improvement. These latter two are the only other crossings of the main line railroad on this particular section of the highway. The minimum radius of any curve on the improved road is 400 feet and the maximum grade is 6.19 per cent, while on the old highway the minimum radius was 50 feet and the maximum grade was 7.47 per cent.

The contractors, Jahn and Bressi, had the best of equipment and were prepared to and did push the work to early completion. Mr. Bressi spent most of his own time on the job and the active cooperation he extended every plan for improvement made it possible for us to include many of the line and grade changes in the contract during construction. Credit also should be given to Mr. Henry Fenton, who had

LINE AND GRADE CHANGES REMOVE HAZARDS FROM HIGHWAY



ADDITIONAL AERIAL VIEWS, JAHN AND BRESSI CONTRACT—Above, near the San Diego city limits—four curves with radii of 166 feet to 400 feet changed to two curves with 400-foot radius and two with 500-foot radius. Grades of 6.4 to 7 per cent reduced to a maximum of 6.17 per cent. Below, Close-up of the line change at Cardiff, showing elimination of grade crossing and improved alignment.

a subcontract for the grading, and who cooperated heartily in planning and executing his work so that it fitted in with the progress in obtaining rights-of-way for the various line and grade changes.

Plan Advances Use of New Pavement.

It caused some confusion and extra work on the part of the resident engineer and the division office and some inconvenience to the contractors to handle the line changes and

secure rights-of-way during the progress of the contract. This plan of action, however, made possible the completion of the improvement and its use by the public about one year earlier than if all line changes had been worked out and all rights-of-way secured before the work was advertised for contract.

On completion of the contract, for the purpose of obtaining aerial photographs at various points, arrangements were made with the Commanding Officer of the United States Air Service at Rockwell Field, San Diego, for an airplane to take a photographer over the new work. A number of the views secured are reproduced in this issue of the bulletin. They, by no means, cover all of the line and grade changes made, but give an excellent idea of the nature of the work accomplished.

Data on Important Changes.

The following data regarding curvature and grades at a number of points photographed present just what was done from an engineering standpoint:

Summary of the work shown on the front cover, lower view, page four, and upper view, page six (Encinitas-Cardiff line change):

Alignment

Old	*New*
1 curve, radius 500 feet	2 curves, radius 1,000 feet
1 curve, radius 400 feet	1 curve, radius 1,500 feet
1 curve, radius 90 feet	1 curve, radius 3,000 feet
1 curve, radius 150 feet	
1 curve, radius 760 feet	
1 curve, radius 1,292 feet	
1 curve, radius 288 feet	
1 curve, radius. 85 feet	
2 grade crossings of Santa Fe Railroad.	No crossings of Santa Fe 350 feet shorter than old line.

Grades

Maximum, 7.10 per cent	Maximum, 4.75 per cent

On section A, as shown in top view, page four, Station 0+00 to Station 27+00:

Alignment

Old	*New*
1 curve, radius 166 feet	2 curves, radius 400 feet
1 curve, radius 288 feet	2 curves, radius 500 feet
1 curve, radius 200 feet	
1 curve, radius 400 feet	

Grades

400 feet, 7 per cent 600 feet, 6.4 per cent	Maximum, 6.17 per cent

Section B, Station 439+00 to Station 503+00, as shown in upper view, page eight:

Alignment

Old	*New*
1 curve, radius 80 feet	1 curve, radius 1,000 feet
1 curve, radius 50 feet	1 curve, radius 600 feet
1 curve, radius 250 feet	2 curves, radius 1,200 feet
1 curve, radius 353 feet	
1 grade crossing of Santa Fe Railroad.	Over-head crossing of Santa Fe (not yet built); new line is 1,062 feet shorter than old line.

Grades

Maximum, 6.47 per cent	Maximum, 6 per cent

Section A, Station 255+00 to Station 287+00, as shown on page eight, lower view:

Alignment

Old	*New*
1 curve, radius 90 feet	2 curves, radius 1,000 feet
1 curve, radius 270 feet	
1 curve, radius 114 feet	

Grades

Maximum, 5.88 per cent	Maximum, 5 per cent

Changes Section B, Station 273+00 to Station 300+00 (not shown in illustrations):

Alignment

Old	*New*
1 curve, radius 200 feet	1 curve, radius 5,000 feet
2 curves, radius 500 feet	
1 curve, radius 100 feet	

Grades

350 feet, 7 per cent	Maximum, 3.5 per cent

Changes Section B, Station 315+00 to Station 365+00 (not shown in illustrations):

Alignment

Old	*New*
2 curves, radius 200 feet	1 curve, radius 3,600 feet
3 curves, radius 300 feet	1 curve, radius 5,249 feet
1 curve, radius 400 feet	
1 curve, radius 500 feet	New line is 115 feet
3 curves, radius 1,000 feet	shorter than old.

Editor's Note: Mr. George, the writer of the above article, was resident engineer on the Jahn and Bressi contract under the general supervision of S. V. Cortelyou, division engineer at Los Angeles. The accompanying aerial photographs were secured through his enterprise. Mr. George was himself an aviator with the United States Air Service during the war and is officially credited with having brought down a German plane.

BOSTON FOREFATHERS HAD THEIR TRAFFIC TROUBLES BACK IN 1757

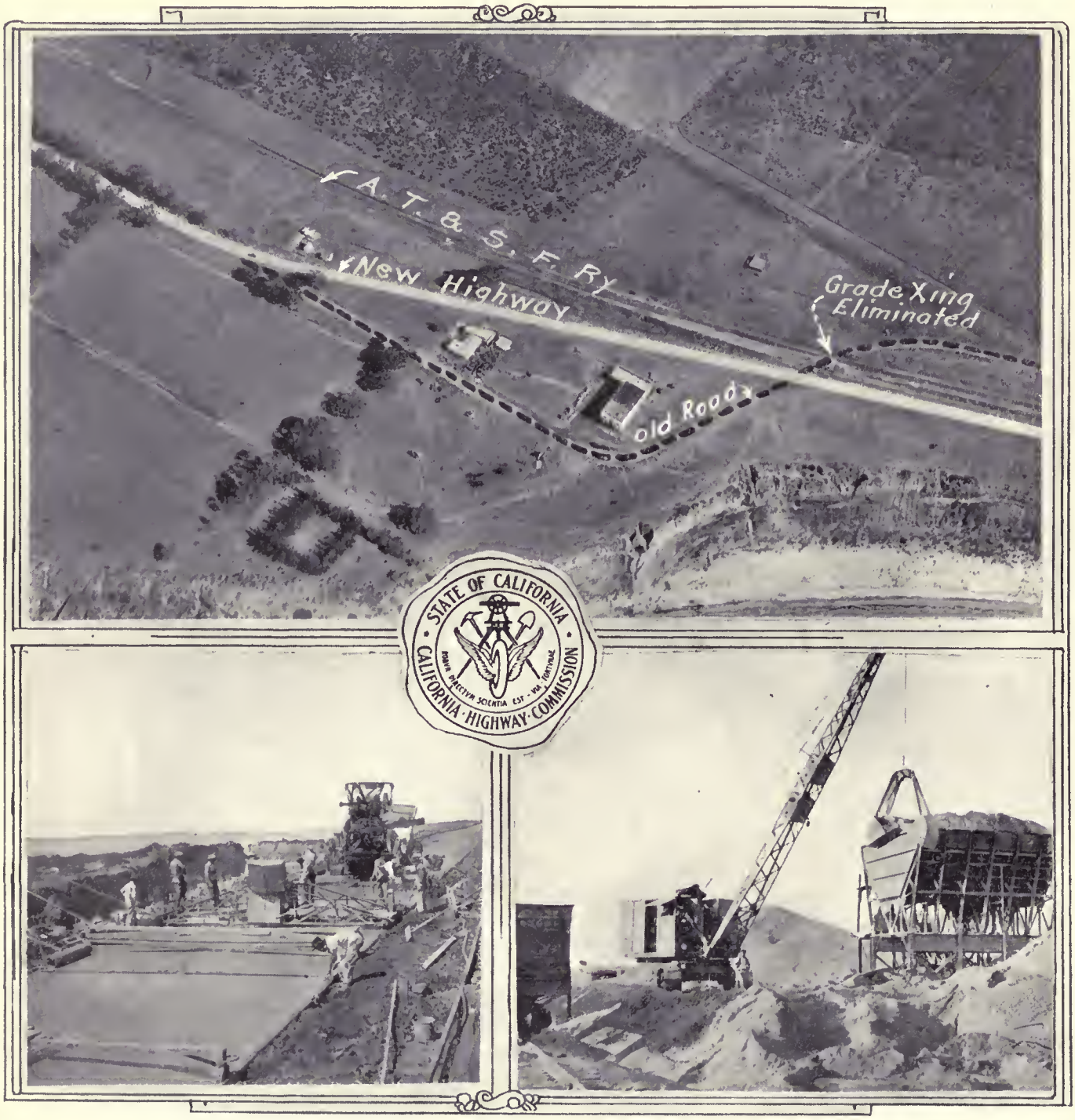
TRAFFIC regulation on the public highways is not wholly of modern origin, it is indicated by the Boston *Transcript* which cites a quaint old ordinance adopted by the selectmen of Boston in 1757.

Those city fathers declared that owing to "great danger arising oftentimes from Coaches, Slays, Chairs, and other Carriages, on the Lord's days, as people are going to or coming from the several Churches in this Town, being driven with great Rapidity, and the Public Worship being oftentimes much disturbed by such Carriages, it is therefor Voted and Ordered, that no Coach, Slay, Chair, Chaise or other Carriage, shall at such times be driven at a Greater Rate than a foot Pace, on Penalty to the Master of the Slave or Servant, so driving, of the Sum of ten shillings."

Not Loud Enough.

"Jack's got a new siren for his car."
"Really! What became of the blond one?"—*London Mail.*

IMPROVEMENTS MADE POSSIBLE BY THE GASOLINE TAX



CLOSE-UP VIEW OF THE GRADE CROSSING ELIMINATION AND LINE CHANGE AT ENCINITAS, JAHN AND BRESSI CONTRACT, SAN DIEGO COUNTY—The new highway is located on the west side of the railroad near the ocean and the improvement in alignment is clearly evident. Below, the contractors' central proportioning plant and modern paving machinery in operation.

NAMED TO COMMITTEE.

The State Highway Engineer has approved the appointment of Equipment Engineer R. H. Stalnaker as a member of the Committee on Equipment of the American Association of State Highway Officials. He will represent California.

NEW ROAD INTO WEAVERVILLE.

"We could not ask for a better road at this time, or for a nicer grade."—*Weaverville Journal.*

Achievement.

Man (at scene of auto wreck): "What happened?"
Battered Swain (exultingly): "I—I kissed her!"

USE OF HYGROSCOPIC SALTS AS A DUST PREVENTIVE ON NORTHERN CALIFORNIA STATE HIGHWAYS

By H. S. Comly, Division Engineer, Redding.

WHAT may be considered a severe test of calcium chloride and magnesium chloride as dust preventives has been made by Division II during the last three years on crushed rock and gravel surfaced state highways in several northern California counties.

H. S. Comly

Application of these salts was made on about thirty-two miles of highway in various amounts and under different conditions of road surface and of the atmosphere, considering its humidity. Sections of the Pacific highway, in the Sacramento River drainage and across the summit in the Klamath River drainage, were the locations of these experiments. In all, parts of 115 miles of highway have been treated. Conditions in this part of the state vary from large, open valleys, foothills, rugged country, with areas of arid land, to timbered mountains with well-watered streams. The altitude averages 500 to 3500 feet.

Humidity Low.

During the summer months the humidity over this entire district is low. Dew is not found in the mornings and fog is practically unknown. As the efficacy of hygroscopic salts as a dust preventive depends directly on the moisture in the atmosphere, the severity of the test in the district described and on his particular highway is evident.

The first section treated was a stretch of four miles in the Sacramento River canyon, near its headwaters, between Castella and Dunsmuir. It had a surface of crushed rock of two-inch maximum size, but during the course of several years' maintenance the surface had become permeated with red sedimentary soil peculiar to this section. This soil has a rather large clay content which we now realize is essential when this treatment is attempted in dry atmospheres.

First Tried in 1922

The material used was commercial, granulated calcium chloride, containing 75 per cent pure hygroscopic element. The first application was made in July, 1922, at the rate of 2½ pounds of commercial salt per square yard. The surface was thoroughly smoothed and saturated with water, after which the applications were made, at intervals of ten days, in two courses of 1¼ pounds per square yard each. For a month after the surface was sprinkled at intervals of one week.

This treatment held the road fairly well, during the remainder of the summer of 1922, under a traffic of about 1200 vehicles per day. Just before the fall rains set in, however, it appeared to have lost much of its potency.

In the spring of 1923, during the period of late rains, a second application of one pound per square yard was made and the road kept thoroughly smooth until the rains ceased and the roadbed was finally dried out for the summer. During the following summer months, the road carried more than 1500 vehicles a day and remained smooth, firm and dustless without further maintenance.

It might be well to mention that, on the adjacent forty miles of road to the south, we spent about $700 per mile during the summer in operating sprinkling trucks and drags in an effort, only partially successful, to hold the road under this same traffic.

Binder is Necessary.

During the summer of 1923, a stretch of three miles of crushed rock surface in the lower Sacramento Canyon, near Pollock, was treated with about 1¾ pounds per square yard of commercial granulated calcium chloride. Here the rock surface was a moderately hard slate, and, while this rock makes a smooth, durable wearing surface in itself, the surface is quite impermeable and has little binding or sticking qualities.

We soon learned that the small amount of moisture in the atmosphere was not sufficient to hold this type of surface effectively under a traffic of 1000 vehicles per day, and that the treatment was not economical unless a proper amount of suitable binder soil was incorporated with the surface. Practically all traces of this application disappeared within six weeks, although for the first three or four weeks it was quite effective. The cost of adding binder in this particular location was too great and no further applications were made.

(Continued on page 9.)

"AN OUTSTANDING JOB"

CHAIRMAN HARVEY M. TOY of the highway commission is in receipt of the following unsolicited letter from John Lawrence Fox, secretary of the San Diego Chamber of Commerce, regarding the San Diego-Oceanside paving contract:

"The Board of Directors of the San Diego Chamber of Commerce, at their last meeting, had called to their attention the efficient work of the State Highway Commission on the coast highway between San Diego and Los Angeles. From the discussion that followed, it appeared that it was the unanimous sentiment of the board that a letter of congratulation should be written to you in regard to the truly splendid and efficient way in which this project had been handled, not only by the State Highway Commission and its engineers, but by the contractors and all others who had taken part in the work.

"Throughout the months that the project has progressed, San Diego has always received the fullest cooperation from all those engaged on the work, and it is the belief of the Board of Directors that through this spirit of cooperation there has been an absolute minimum of inconvenience worked upon the traveling public making use of the road. Further, our contact with the work leads us to believe that it is one of the outstanding jobs of highway construction accomplished in the state.

"It is a real pleasure on behalf of the Board of Directors to express to you their appreciation."

ELIMINATION OF CURVES FEATURES SAN DIEGO CONTRACT

A SHORTER AND SAFER HIGHWAY—Above, Radical line changes at Carlsbad, on the San Diego coast, which will eliminate right angle turns and a grade crossing when the new overhead crossing is completed. Radius of curves reduced from a minimum of 50 feet to a minimum of 600 feet. Grades reduced from 6.47 per cent to a 6 per cent maximum. Line shortened 1062 feet at this point. Below, three curves with a minimum radius of 90 feet reduced to two with a radius of 1000 feet. Grade lowered from 5.88 to 5 per cent maximum.

COMLY TELLS OF SALT TESTS

(Continued from page 7.)

Early in the spring of 1924, a stretch of two miles of graveled highway in the northern end of the Sacramento Valley, at Redding, was treated with 3½ pounds per square yard of commercial granulated calcium chloride, applied in two courses. This section had been surfaced with round creek gravel, impregnated with a considerable amount of sand containing a large percentage of iron-stained clay wash. The moisture in the atmosphere in this locality is somewhat less than in the preceding two cases. This stretch sustained a traffic of about 1500 vehicles per day effectively through the past summer. A light sprinkling was given it about once a month because of the extreme dryness of the season.

It should be noted also that this section was subjected to a large traffic of five-ton trucks in service on an adjoining paving contract. We expect that another application of about one pound per square yard, to be applied next spring, will hold this unit in good condition through next summer's traffic.

Experiments in Shasta Valley.

During June and July of 1924, a twenty-five-mile section of crushed gravel highway in Shasta Valley, south of Yreka, Siskiyou County, was treated with both commercial granulated calcium chloride and calcium chloride in solution. Separate units were treated with each material, applied in equal amounts per square yard and based on the actual anhydrous salt content of each. Like surface conditions were approximated as nearly as possible in order to make a fair test of each compound. Bearing in mind our previous experience, an effort was made to supply the surface with the proper amount of binder soils. The air in the Shasta Valley is very dry, except in a small irrigated area producing alfalfa, where the atmospheric moisture present was very noticeable in its effect on the treated highway passing through it.

All of the salts used were applied at the rate of 1.3 pounds per square yard of the anhydrous element contained in them, which is equal to 1¾ pounds of commercial granulated calcium chloride. One mile of the road was given a second application of magnesium chloride immediately following the first, each application containing 1.3 pounds per square yard of anhydrous element.

Plans for Next Summer.

This entire section carried an average of 1500 vehicles per day during the last three months of last summer, an exceptionally dry season. The only other maintenance was a light sprinkling every two weeks. The road remained quite dustless and equal to a pavement in riding qualities, particularly that portion on which the double application was made. We plan to make an equal application of each of the materials next spring, and expect this treatment to hold the road satisfactorily without maintenance through next summer's traffic, which, in all probability, will exceed 2000 machines a day.

It is not possible now to reach definite conclusions as to the relative merits of each of the materials used, but conditions indicate that the relative order of effectiveness is magnesium chloride in solution, granulated calcium chloride, and calcium chloride in solution.

In the section of California covered by these tests, the cost of application of hygroscopic salts, using equal amounts of their anhydrous elements per square yard of surface, is practically the same for each material mentioned. Exclusive of providing binder for the surface, and using a strip twenty feet wide and 2.6 pounds of the anhydrous element per square yard for the first year, the cost amounted to $900 per mile of road. The cost of a light application each succeeding year, say one pound of the anhydrous element or 1⅓ pounds of the commercial salt, would be about $300 per mile.

May be Continued.

Experience indicates that this process may be continued effectively for an indefinite period. Assuming the treatment will be effective for three summer seasons only, the average summer maintenance cost for the road surface alone will be about $600 per mile. This will provide a surface practically equal to a pavement in riding qualities and one that will stand up under a traffic of 1500 vehicles per day. Maintenance of gravel and crushed rock roads under this volume of traffic, by the ordinary means of sprinkling, dragging and adding new crushed rock, will cost, on the average, more than $1000 per mile per summer. This expenditure may provide a smooth road, but, with this volume of traffic, it will still be dusty and uncomfortable for the traveler.

Some Conclusions.

Use of hygroscopic salts, our experiments indicate, is an effective method of maintaining gravel or crushed rock roads subjected to a heavy volume of traffic. The amount required, and consequently the cost, will depend upon the humidity of the atmosphere. The judicious use of a suitable binder for the rock surface is essential to effective results in the dryer atmospheres and an aid to good results in more moist atmospheres.

It is highly essential that a road surface be provided which, with the moisture secured through the agency of the salt, will form a surface thoroughly resistant to the suction of rubber-tired vehicles. If the road surface is such that the small amount of water drawn form the air will not produce this result, the effectiveness of the treatment will be lost.

It is not reasonable to expect, therefore, that this treatment will be effective on a surface of small gravel or rock alone, except possibly in the most humid atmospheres. In preparing the surface, however, care should be exercised not to use an excessive amount of clay-like binder as the result in wet weather may prove undesirable.

These experiments were financed from special allotments made the division from the motor vehicle and gasoline tax funds.

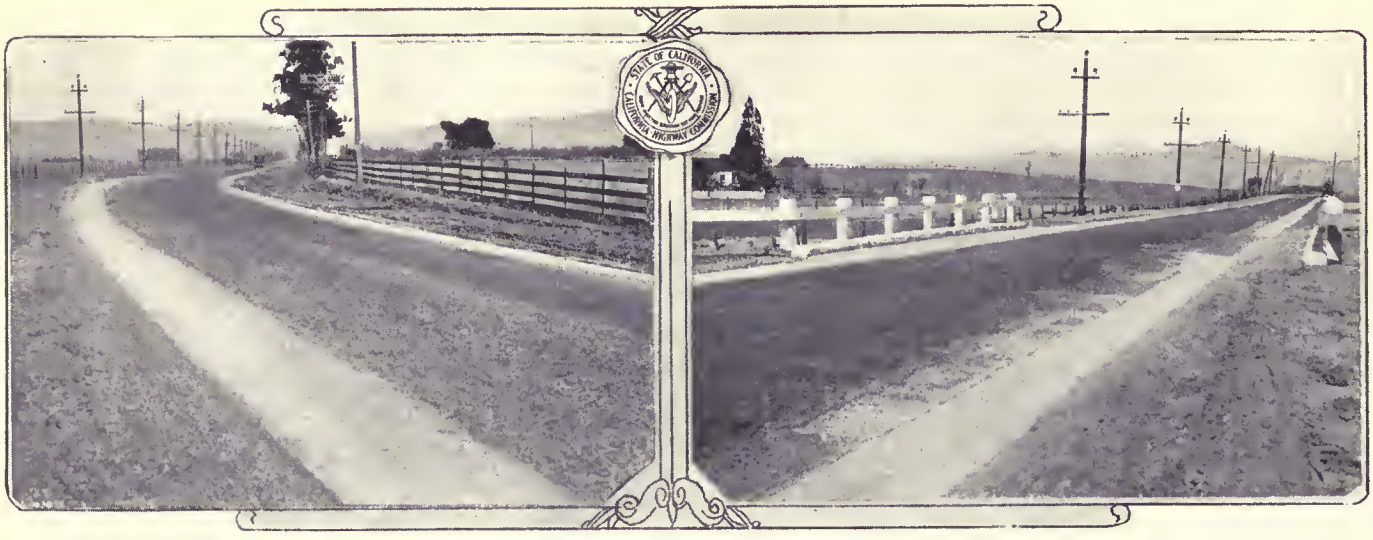
At the San Francisco convention, an easterner was heard to say: "San Francisco has been well termed 'The Convention City.' Her hospitality is both inspiring and stimulating."

Quite Another Matter.

Irate Papa: "No, sir. My daughter can never be yours."
Bright Suitor: "Quite right, sir. She can not possibly be my daughter. I only wanted her to be my wife."

His Idea.

First Steno—"The idea of your working steady eight hours a day! I would not think of such a thing!"
Second Steno—"Neither would I. It was the boss that thought of it."—*Town Topics.*



GREENVILLE-LIVERMORE WIDENING JOB—Old fifteen-foot pavement in Alameda County, widened to twenty feet with flush concrete shoulders to carry increasing traffic. Right, new guard rail placed on culvert; at the left, curve superelevated with asphalt macadam. The new shoulder is seven inches thick and extends under the edge of the old pavement, strengthening it and prolonging its traffic service. (Photos by Div. IV.)

WIDENING THE STATE HIGHWAY IN ALAMEDA COUNTY

By A. W. McCurdy, Assistant Division Engineer.

AN INTERESTING feature of the widening work between Greenville and Livermore, Alameda County, recently completed in Division IV, was the plan adopted for superelevation of curves where the original pavement had been placed without this modern improvement in road building.

For 4.3 miles between these two points, the existing fifteen-foot concrete pavement was widened to twenty feet by laying flush concrete shoulders 2½ feet wide and seven inches thick. The roadway width was graded to thirty feet and in some places thirty-four feet by addition of excess material from excavations.

How Superelevation Was Secured.

The superelevation was provided for on curves by using the surface slope for one-half of the old pavement as a base, and drawing a line that would raise the grade of the shoulder on the outer side of curves approximately seven inches above the grade of the shoulder on the inner side. The resulting wedge, or space left between the edge and grade of the new shoulder and the surface of one-half of the old pavement, was filled with asphalt macadam.

The latter work was done by state forces after completion of the shoulders by the contractor. Long run offs at each end of the curves accomplished the transition without sharp changes in grade. State forces also lengthened the existing pipe culverts and made necessary excavations and embankments before work was commenced on subgrade operations for paving.

In preparing subgrade, the contractor used a 30-h.p. tractor with scarifier and blade and all excavation was made to rough subgrade by this method. Much of the finished grade was done by a specially constructed Carr type grader. Some hand finishing was required where the edge of the new shoulder extended under the edge of the old concrete pavement. This was done to seal the joint and strengthen the edge of the existing concrete slab.

A central mixing plant was used by the contractor, the equipment consisting of a three-sack Chicago-Smith paver with Johnson batch hoppers. Aggregates were hauled directly from their source in Niles Canyon and the mixed concrete was hauled to the point of use in Ford trucks, equipped with a specially designed body that permitted dumping from either side.

Unusual Tamping Method Employed.

An unusual method of tamping was employed in finishing the concrete, which proved most successful. A hand tamper sixteen feet in length with plow handles was made, similar to former models used on concrete work. The ends of the tamper were notched to allow of bearing on a 3-inch by 8-inch plank placed at right angles from the edge of the existing pavement to the header board. Care was taken to place one end of the plank at such places on the old pavement that in longitudinal finishing the surface of the shoulder would match flush, as close as possible to the grade of the present pavement surface.

As the tamper was moved ahead, a lap of three feet was made in finishing to insure a smooth riding surface.

Wet burlap was used for curing the new shoulders. It was used in rolls seventy-five feet long and, after being placed over the concrete was kept wet with frequent use of a hose.

Earth shoulders were graded to the edge of the new shoulder and the entire roadway crowned to match the existing pavement. The result is a much improved condition and a roadway adequate to handle for some time, it is hoped, the rapidly increasing traffic on this section of the highway.

W. A. Dontanville was the contractor and M. C. Fosgate, resident engineer. The improvement cost approximately $54,500, or $12,680 per mile.

The contract was financed with gasoline tax and motor vehicle revenues.

PISMO GRADE CROSSING ELIMINATION PLANNED

COMMISSION APPROVES BOLD SCHEME TO IMPROVE LAST GAP IN COAST HIGHWAY; COUNTY TO AID IN WORK

UNTIL recently, the Coast highway from Los Angeles to San Francisco was marred by two small gaps in that long stretch of continuous pavement. One of these, at the south city limits of King City, has just been eliminated by the construction of the San Lorenzo Creek bridge and the paving of the approaches, Monterey County, King City and the California Highway Commission cooperating. The elimination of the one remaining break, at Pismo Beach, now seems assured.

The short gap existing at this point includes a grade crossing of the main line of the Southern Pacific railroad, a bridge over a fair-sized creek, and several sharp turns. The alignment is poor. Numerous suggestions have been made for improving this condition, but the necessity of bringing the county, railroad company, the Railroad Commission, and the Highway Commission into agreement has delayed action ever since the initial construction of the highway.

New Plan Given Approval.

Recently, however, the commission decided upon a bolder improvement than any previously contemplated. The plan approved not only will eliminate all curves on the exception in question and substitute an overhead crossing for the present grade crossing, but also will eliminate or greatly improve the alignment of the highway for a half mile south of the present gap.

The cooperating parties have agreed to the proposed improvement and San Luis Obispo County has appropriated $25,000 toward the cost of the work. It now appears reasonably certain that bids will be asked at an early date. When the work is finished, the Coast highway will present a continuous pavement from Los Angeles to San Francisco.

The plan agreed upon was suggested by the headquarters bridge department.

FOREST PROJECT TO OPEN SMITH RIVER TO MOTORISTS

THE forest highway project now nearing completion on Smith River, in northern Del Norte County, with the work under way along the same stream by a prison road camp, soon will open to motor travel one of the most beautiful sections of California, a district now utterly unknown to most residents of the state.

This is the opinion expressed by engineers of Division I, who are in contact with the progress of the grading operations that have been financed cooperatively by the United States Forest Service and the California Highway Commission.

The forest highway along the banks of Smith River, in the Siskiyou National Forest, has a grade of about 1 per cent and winds through a canyon, the walls of which have an elevation of 2000 to 5000 feet. The present road climbs to this elevation, high above the river.

Many Beauty Spots.

In the bottom of the canyon, never before accessible by a roadway, the engineers report a splendid growth of pine, cedar, oak, and redwood. In many places, the canyon widens into little flats and other beauty spots by which Smith River, fed by springs, flows unabated during the dry summer months.

The highway has good alignment and averages about twenty-one feet wide. Of the forty miles on the Redwood highway between Crescent City and the Oregon line on the road to Grants Pass, eighteen miles are under construction, twelve miles by contract and six miles by convict labor. In addition, twelve miles of grading has been finished and will be opened to traffic as soon as necessary bridges and surfacing have been completed.

Opening to travel of this twelve-mile section, which probably will take place next summer, will eliminate Gasquet mountain and greatly improve travel conditions between Crescent City and Grants Pass.

A new steam heating plant has been installed in the headquarters shop. It is equipped with an automatic feed and makes unnecessary the services of a fireman.

And Sometimes Kicks.

Father (upstairs): "It is time for that young man to go home."
Young Man: "Your father is a crank."
Father (overhearing): "Well, when you don't have a self-starter a crank comes in mighty handy."—*Exchange.*

Surprise.

The first asphalt road in the United States was built in 1879 in front of the City Hill, Newark, N. J.—Newspaper Item.

This will come as a surprise to about 365,981 motorists who thonght they drove over it this summer in other cities.—*Lackawanna Motorist.*

SMITH RIVER FOREST PROJECT—Construction scenes in Del Norte County where a forest highway project on the Grants Pass state highway connection is opening up a virgin territory. Left, steam shovel crossing temporary bridge. Right, the new grade along the river. (Div. I.)

WHAT THE DIVISIONS ARE DOING

ELECTRIC TRAFFIC GATES TO BE ERECTED NORTH OF EUREKA SLOUGH

DIVISION I reports a contract awarded for the erection of electric traffic gates on the drawbridge across Eureka Slough, at the northern city limits of Eureka. The gates are designed to prevent careless motorists from driving off the bridge when the lift span is raised. The operation of the gates will be controlled automatically by the raising and lowering of the span.

Division I keeps on breaking storm records. The record for low temperature also is having its inning, especially in the territory north of Willits. Traffic, however, has been kept moving with a minimum of inconvenience.

NEW LOCATION CUTS PACIFIC HIGHWAY DISTANCE TWO MILES

COMPLETION of the contract recently awarded Edwards Brothers of Los Angeles for the widening and relocation of eleven miles of the Pacific highway between Halfway Creek and Dog Creek, in the Sacramento River canyon, will cut the distance two miles between Redding and Dunsmuir, reports Division II. Considerable adverse grade also will be eliminated and the roadbed widened to 28 and 30 feet with rock surfacing 20 feet wide. Pipe culverts will be encased in concrete. The project will be financed with gasoline tax funds.

Grading Contract Finished.

Grading has been completed on the Bayha-Halfway Creek contract of the Nevada Contracting Company, north of Redding, and placing of surfacing should be completed by the end of this month. Some shoulder work and final cleaning remains to be done before the work is finally accepted. The highway is now open for twenty-four hours daily.

Dunn and Baker are expected to complete the extension of their contract for widening the Pacific highway between the state line and Shasta River early next month. Surfacing is now being placed.

With the completion of the grading in the vicinity of Weaverville, all work by state forces in Division II has come to a standstill. Some 2½ miles of grading and surfacing was done to improve the lateral connection with Trinity County.

Snow Plows Working.

Division II has had its snow plows working a number of times during the last month. Heavy snowfalls followed by unprecedented cold weather, which froze the snow, caused some trouble, but traffic was accommodated at all times.

WEATHER SLOWS DOWN GRADING ON CONTRACTS IN DIVISION III

COLD weather in the mountains and rain in the valley has slowed down grading operations on several contracts in Division III during the past month. The extremely cold weather made operations difficult in the Truckee River canyon, Nevada County, and there was a temporary shut down on the work between Boca and Floriston. The Truckee-Boca contract of Irey and Holden is practically finished.

C. R. Adams has nearly three miles of grading completed on the Colfax-Gold Run contract and is operating two power shovels with a force of sixty-three men.

Rain Delays Paving.

The contract of Giddings and Whyte for grading 6.9 miles of the Tahoe-Ukiah highway, west of Williams, Colusa County, have suspended operations due to the wet weather.

Rains at frequent intervals have delayed completion of the asphalt paving job, west of Chico, on the Chico-Orland state highway.

Shoulders are being built up and drainage improved on several sections of the trunk line highways in the Division III, in various parts of the Sacramento Valley.

The Lincoln and Victory highways to Lake Tahoe were closed to traffic by snow about December 15th.

BELTANE-SCHELLVILLE CONTRACT COMPLETED, DIVISION IV REPORTS

GALBRAITH AND JANES have completed the contract for grading and paving between Beltane and Schellville, Sonoma County, Division IV, and the entire distance is open for traffic, except two miles between Beltane and Warfield which is on new right of way eliminating two grade crossings. This will be opened up as soon as the contractors complete the new bridge across Calabazas Creek which is being built by Sonoma County under state inspection. The bridge will be finished sometime during January and the entire route through the Valley of the Moon, from Santa Rosa to Schellville, will be open to traffic, a distance of twenty-five miles.

The roadway of the Peninsula highway through Menlo Park has been widened to fifty feet, and the pavement to thirty on the major portion of the Freeman and Whiting contract which is now complete except for construction of a concrete culvert near Menlo Park. Traffic facilities have been materially improved between Redwood City and Palo Alto.

Rapid Progress on Skyline.

Contractor J. P. Holland has begun operations on the last two miles of his grading contract on the Skyline boulevard. Crushed rock surfacing is being placed as fast as the work progresses and the time when one of the most scenic sections of the Skyline route will be opened for traffic is not far distant.

Contractor D. A. Foley has a narrow gauge industrial railroad at work hauling excavated material from South San Francisco for the construction of the fill for a section of the Bay Shore highway. A dredge also is at work excavating canals. Faster progress is expected when Belle Air Island becomes available as a source of material for the construction of the roadway embankment.

BIDS ASKED ON BIG GRADING CONTRACT IN DIVISION VII

BIDS will be opened in Sacramento, February 9th, for the grading of a section of the Coast boulevard between Arroyo Sequit and Las Flores Canyon, on the Los Angeles County coast. This section, 16.3 miles in length, is the only unit of the coast route between Santa Monica and Oxnard not completed or under way.

Bridge Under Way.

Construction has been begun by Contractor H. H. Peterson on the Sycamore Canyon bridge, north of Oceanside, San Diego County. The old wooden bridge has been removed and traffic handled over a short detour. The new structure will be of reinforced concrete.

All work on the Coast highway between Huntington Beach and Corona Del Mar has been completed and recommended for acceptance. Rapid progress is being made on the construction of the new bridge across Santa Ana River which will open the new highway to traffic. The bridge is being built by the county.

State forces will complete the grading and paving of approaches to the new reinforced concrete bridge over Santa Ynez Creek on the Coast highway, built by Los Angeles City.

REDLANDS-BEAUMONT PAVING JOB UNDER WAY IN DIVISION VIII

BASICH BROTHERS, contractors, have assembled equipment and started work on the contract for paving the trunk line highway between Redlands and Beaumont, a distance of approximately seven miles, reports Division VIII.

The grading and surfacing contract between the Sand Hills and the Colorado River at Yuma is nearing completion, and, with the building of the bridge across the Yuma irrigation canal, the entire unit will be open to traffic. Ledbetter and Company have begun work on the bridge.

Desert Division Fights Snow.

Strenuous efforts to keep the Crest Route open for traffic are being made by the maintenance forces of Division VIII. Twelve inches of snow have fallen in this section of the San Bernardino mountains to date, but traffic has beep kept moving.

DIVISION ACTIVITIES

NEW HIGHWAY SECTION TAKEN OVER ON DIVISION X ROUTE

SAN JOAQUIN COUNTY having secured the necessary rights of way, the commission has taken over and incorporated into the state highway system the Lodi-Lockeford section of the San Andreas lateral. The new highway which comes under the jurisdiction of Division X is 12.49 miles in length.

Two important asphalt concrete jobs have been completed in Division X during the month. Force and Currigan finished the Vacaville-Batavia unit, Solano County, after several delays due to rainy weather and the Valley Paving Company has completed work on the Banta widening job in San Joaquin County. The vialog test on the latter job shows but twenty-seven inches of roughness per mile, an excellent record. The overrun amounted to but 70 tons of asphaltic concrete, less than one-fourth of 1 per cent.

Survey Work Authorized.

C. W. Springer had charge of the completion of the work at Banta after Resident Engineer C. O. Dingle was transferred at the bridge department.

Authority has been granted for survey and drainage work on the Upper Stockton road, Sacramento County, which has been placed in charge of C. M. Butts. He also will have charge of the survey for the Arno cutoff on the same road.

State forces are now at work grading the approaches to the Dry Creek bridge, in Amador County, recently completed at county expense but under state supervision.

Grading of the Jackson-Pine Grove section is expected to be under way under contract in the near future.

BRIDGE DEPARTMENT NEWS

M. E. WHITNEY, recently transferred to the bridge department from Division X, has been assigned to the Rincon Seawall contract as assistant resident engineer.

A. L. Richardson has been assigned to the Chowchilla River bridge in Madera County, as resident engineer.

John C. Wilson, resident engineer on the Klamath River bridge, spent a few days in Sacramento recently in conference with Mr. Miller. His friends regret to learn of the illness of Mrs. Wilson, who is in a San Francisco hospital.

The twelve bridges on the Upper Stockton road, built by Polk and Polk, have been completed and A. J. Meehan, resident engineer, is in the office preparing his final report.

MAINTENANCE STATION SITE PURCHASED IN SANTA BARBARA

THE maintenance department of Division V has taken possession of the new maintenance station site recently purchased by the commission in Santa Barbara. The property has an area of 130 by 343 feet and is located on West Haley street, near the intersection of San Pasqual street.

Division Engineer L. H. Gibson announces the residence of the local maintenance foreman will be established on the property, which will be headquarters for a district extending from the Ventura County line northward to Gaviota.

In addition to the maintenance foreman's residence, provision will be made at the station for storage of equipment and materials necessary for maintenance work in the vicinity of Santa Barbara.

Sure Proof.

Magistrate—"And what was the prisoner doing?"

Constable—"'E were 'avin' a very 'eated argument with a cabdriver, yer worship."

Magistrate—"But that doesn't prove he was drunk."

Constable—"Ah! But there weren't no cabdriver there, yer worship."

OPENING UP THE OWENS VALLEY

SUBSTANTIAL improvement of the highway between Mojave, Kern County, and Independence, Inyo County, a distance of 133 miles, during the year 1925, is promised the people of southern California by the California Highway Commission. That traffic may be better served, this section of the state highway has taken over for maintenance until such time as funds for construction are provided.

The maintenance budget of Division IX, in which the section is located, includes approximately $400 per mile for the work during the coming spring and summer. The pavement at Mojave will be connected with the improved highway in Inyo County by a better road than now exists across the Mojave desert.

The improvement will be made on the surveyed right of way wherever possible and will consist of grading and dragging, and if funds are sufficient, some surfacing. The work will be in charge of Division Engineer F. G. Somner of Bishop.

In Mono County, also in Division IX, the commission has taken over for maintenance an eighteen-mile section between McGee Creek and Deadman's Creek. Some grading, shaping and surfacing will be done.

Receipts from the motor vehicle and gasoline tax funds, to be received during 1925, make it possible for the commission to undertake the work.

THE RECORD FOR 1924

THE following, in brief, is the total of expenditures and mileage of roads completed by the California Highway Commission during the calendar year 1924:

EXPENDITURES.

Second state highway fund	$1,811,114 33
Third state highway fund	6,833,368 34
Motor vehicle and gasoline tax funds (maintenance and reconstruction)	8,812,723 02
Miscellaneous funds	262,447 97
Grand total	$17,719,653 66

FEDERAL AID.

Federal aid collected during 1924 (paid into bond funds)	$3,556,684 86

MILEAGE OF ROADS COMPLETED AND ACCEPTED DURING 1924.

Original construction—	Miles
Graded and rock surface	282.8
Rock surface only (previously graded)	145.3
Cement concrete pavements	29.2
Asphalt concrete pavements	10.1
Asphalt macadam	52.5
Total	519.9
Reconstructed pavements (various types)	87.5
Reconstructed grades (widening and straightening)	39.0
Total miles completed and accepted (original and reconstructed)	646.4
Work under way and bids pending January 1, 1925 (all types)	167.3

Extensive.

Motorist—"It's preposterous. I'm an expert driver. What I know about driving would fill a book."

Policeman—"And what you don't know would fill a hospital. Give me your name and address."

That indefinable thing we call charm is what enables a girl to violate the traffic rules day after day with absolute impunity.

CALIFORNIA HIGHWAYS

OFFICIAL PUBLICATION OF THE

CALIFORNIA HIGHWAY COMMISSION

SACRAMENTO, CALIFORNIA

HARVEY M. TOY, Chairman;
N. T. EDWARDS and LOUIS EVERDING, Commissioners.

ROBERT M. MORTON, State Highway Engineer.

W. F. MIXON, Secretary.

We are pleased to permit publication of any of the matter contained herein or to loan cuts and this privilege is extended newspapers and periodicals without restrictions.

FRANK B. DURKEE - - - Editor
P. O. Box 1103, Sacramento, California.

Vol. 2 JANUARY, 1925 No. 1

JUST AMONG OURSELVES

☆ ☆ ☆

HIGHWAY NEWS NOTES

Maintenance Man Transferred.

DIVISION I announces that C. A. Miller, formerly in charge of maintenance in Mendocino and Lake counties with headquarters in Willits, has been moved to Eureka where he will superintend maintenance activities in Humboldt and Del Norte counties.

Paul St. John has succeeded Mr. Miller at Willits.

We are glad to report that C. C. Darrow, chief clerk at Willits, is back at work after a recent severe illness.

B. W. Booker, chief draftsman in Division I, is the proud daddy of an eight-pound daughter.

Carlton Fletcher and Miss Helen Navarro, clerks at the division headquarters at Willits, have resigned and moved to San Francisco to accept positions.

"Beginning to Feel at Home."

Division II is "beginning to feel at home" in the new division headquarters at Redding. Division Engineer Comly is having the grounds cleaned up and lawns planted, that the new building may present a pleasing appearance to motorists passing through Redding on the nearby state highway. The division was accused of bringing with it from Dunsmuir an eight-inch snowfall.

Many of the Division II folks went home for Christmas. H. K. Ward, chief of party, and R. E. Ward, resident engineer, enjoyed short holiday vacations in San Diego.

Some Boy.

ACCORDING to reports from Division III, Albert Rogers McEwen, recently arrived son of A. R. McEwen, assistant resident engineer on the grading contract in the Truckee River Canyon, has filed an application for rodman with Mr. Haselwood's outfit.

John R. Andrews, formerly with headquarters, has been appointed clerk in Division III.

Mrs. Mary Brown, clerk with Division III, is recovering from a serious illness.

H. B. LaForge is acting assistant resident engineer on the Chico asphalt paving job.

W. H. Irish, assistant resident engineer, is recovering from an operation for appendicitis.

Division IV Man Turns Farmer.

M. C. Fosgate, formerly resident engineer in Division IV, is ranching near Corning, Tehama County, where he owns farm property.

Ed Blockley, formerly assistant engineer, Division IV, has accepted a position with J. P. Holland, San Francisco contractor.

George J. Wagner, formerly resident engineer on the Skyline boulevard, is now with the American Toll Bridge Company, Crockett.

E. J. Brown, resident engineer on the Redwood City to Palo Alto widening job, plans to leave for Arizona as soon as his work is finished.

J. George Smith, draftsman, has resigned to accept a position with the California Pacific Title Insurance Company.

A. F. Janes, formerly assistant resident engineer, has accepted a position with the Pacific States Construction Company.

John A. Harley, formerly attached to the field forces in connection with widening work on the Peninsula, is in the Redwood Sanitarium, Redwood City, where he is reported as being well on the road to recovery following a recent illness.

Miss Marie B. Lennox, senior clerk in the Division IV office, recently parted company with a set of unfriendly tonsils. After a sojourn to the St. Mary's Hospital, San Francisco, followed by a few days convalescence at her home in Sacramento, she has again resumed her duties.

Miss Marie Hammerstrom, stenographer in the Division IV office, on a recent trip to the wilds of Contra Costa County was violently set upon by a host of poison oak germs and as a result was absent from her desk for several days.

Long Isolation is Over.

AFTER spending two years as resident engineer on the Big Sur grading job, on the Monterey coast almost out of touch with the world, E. B. Brown has returned to civilization and for the present has been assigned to duty in the division office at San Luis Obispo.

George Sowash, expert delineator of Division V, was a recent visitor in San Francisco.

W. P. Inman, draftsman, is back at his work after an operation.

George A. Tilton Jr., chief of party, enjoyed a vacation in Los Angeles following his return from the Kern River Canyon job in Division VI.

Engineer Transferred.

J. P. Andrews has been transferred to Orange County as assistant resident engineer on the McCray contract, reports Division VII.

H. H. Wildy and party are at Capistrano making a survey of the San Juan Creek to Galivan section which is under consideration for reconstruction during 1925.

Oh Joy, Rain on the Desert.

Division VIII is just tickled pink; it has rained on the desert. In fact, it rained twice at Newberry and rain has been reported at Amboy and Goffs. This will help the maintenance men.

McLeod Gets Homesick.

DIVISION engineer J. C. McLeod (and we have a suspicion that his family had something to do with it, too) began to get homesick for the northwest along about Christmas time; and so he tuned up his old bus, took a few days off, and started north. He traveled in snow all through Oregon, but he reached Washington state just before Santa Claus arrived.

R. A. Watkins, superintendent of equipment, Division X, was a speaker recently before the Lions Club of Sonora.

E. W. Zumwalt, of Division X, visited in San Francisco recently for a part of his vacation.

Maintenance Foreman F. M. Walker, of the Division X forces, and his crew, recently presented Mr. R. A. Watkins with the neatly mounted head of a large eight-point buck.

Division X, newest of the divisions, sends best wishes for the New Year to all other divisions.

Kern Engineers Hear Woodson and Grumm.

Fred J. Grumm, engineer of surveys and plans, and J. B. Woodson, division engineer at Fresno, were speakers recently at a dinner given by the Kern County chapter of the American Association of Engineers. Grumm told the meeting of the district convention of the association which he had attended in Los Angeles while in the south on his vacation. Woodson discussed the work under way with convict labor in the Kern River canyon.

January 13th was a lucky day for Claude Simpson, assistant file clerk, headquarters. The stork visited his home, leaving a baby daughter.

NEW BUTTE COUNTY BRIDGE TO AID DRAINAGE PROBLEM

THE completion of a 180-foot concrete bridge, now under way, over the Cherokee Canal by-pass on the Eastside highway in Butte County, near the town of Richvale, will aid materially in relieving a serious drainage condition which, in recent years, has occasioned loss to the farmers of the vicinity and interruption of traffic when flood waters have covered the pavement.

Traffic is being detoured over a short graveled roadway which has been constructed at the side of the bridge site. Necessary steps have been taken to provide for the safety and convenience of the public.

The removal of the existing reinforced concrete pavement caused the contractor considerable difficulty and proved that it was an excellent piece of construction. Over 100 pounds of dynamite was used to break up 180 feet of pavement. Construction of the bridge will permit the opening of a new drainage canal which is believed ample to handle future floods.

Including the roadway approaches, the structure will cost approximately $16,000, of which $5,000 will be paid by Butte County. The work is scheduled for completion about February 1st.

NEW MACHINERY STUDIED

THE California highway department was represented at the annual convention of the American Road Builders Association, held early in the month at Chicago, by Equipment Engineer R. H. Stalnaker. The extensive machinery exhibit in connection with the convention gave Stalnaker an opportunity to make a study of the latest road-building equipment on the market.

He also attended the annual convention of the Society of Automotive Engineers, which took place in Detroit, and later made a study of the equipment and methods used in the removal of snow from the highways in the vicinity of Chicago and other new equipment in use in the east.

Some Epitaphs.

(From the *Angier Idea.*)

Tom Jones has gone to heavenly heights;
He tried to drive without his lights.
Jack Hayes this busy life forsakes;
He never would reline his brakes.
Here's all that's left of Amos Bossing;
He tried to beat it to the crossing.
No more for Brown are earthly smiles;
He took the curve at forty miles.
Ted Small has gone to his abode;
He kept the middle of the road.
Here lies our friend poor Tony Dix;
For booze and gasoline won't mix.
Jim Henry's friends are all bereft;
He made a short turn to the left.
Ben Gray is free from earthly pains;
A rainy day—he had no chains.
Poor Bill's beneath the sod, alas!
He speeded up and tried to pass.
Now Tom has joined the heavenly band;
He tried to drive it with one hand.

Road Information.

No matter where you tour or roam,
The best old road is the road to home.

MUST COMPLETE THE INTERSTATE CONNECTIONS

A REVIEW of California's highway progress shows that not a single interstate road has been adequately improved, while several of them contain missing links from one to two hundred miles in length near the state borders.

This raises the question, "Has California made good on her invitation to the motorists of the nation so far as interstate roads are concerned?"

California can show visitors an unequalled system of touring roads after they literally force their way across the barriers we have permitted to remain on the state borders.

Good Roads on Inside.

Our entering guests find generally improved roads across the neighboring states, with a few exceptions, until they reach the California border where they expect to realize their dreams of a motoring paradise. Sad is their disappointment when they begin to cross our unimproved sections which lie between the state line and the seven thousand miles of paved state and county roads which they ultimately find as they approach the centers of population.

This is not a criticism of the state highway commission which has very properly given its first attention to connecting the main centers of population, but the time has now come when the state highway program must be completely refinanced. We must provide liberally for the completion of our interstate roads at the state borders, that travelers may receive the welcome of genuine hospitality as they enter the state and carry away only pleasant recollections in the event they should depart.—*Motorland.*

NORTH OF SAN SIMEON—Scenes on the recently completed section of the Coast highway north of San Simeon, San Luis Obispo County. (Div. V.)

The map above does not show all of the state highways in California but only those included in the federal aid system, representing approximately 7 per cent of the total road mileage of the state, outside of cities.

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CALIFORNIA HIGHWAYS

OFFICIAL PUBLICATION OF THE CALIFORNIA HIGHWAY COMMISSION

Vol. 2 FEBRUARY, 1925 No. 2

NEW PAVEMENT ON THE PACIFIC HIGHWAY—View on the new ten-mile section of pavement recently opened to traffic just north of Redding, Shasta County. It is of cement concrete, twenty feet wide, with both center and transverse expansion joints. This is the type of pavement which will be extended northward to the Oregon line when additional construction funds are provided. Approximately 100 miles remain unpaved at the present time. (Div. II.)

In this issue: NEW RECONSTRUCTION METHODS TRIED IN DIVISION X—CURING CONCRETE WITH CALCIUM CHLORIDE—RECENT CALIFORNIA EXPERIMENTS.

1925

California Highway Department

California Highway Commission

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PAUL F. FRATESSA, Attorney, San Francisco — W. F. MIXON, Secretary, Woodland

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NEW METHODS USED ON IMPORTANT RECONSTRUCTION PROJECTS IN DIVISION X

By J. C. McLeod, Division Engineer.

TWO important projects that mark a departure from former reconstruction practices in this state were completed during the month in Division X. Both were financed from gasoline tax revenues and involved the use of asphalt concrete for widening and surfacing, including the construction of shoulders. As it is the first test of this particular type of reconstruction in California, the shoulder work is a feature of particular interest.

Between Vacaville and Batavia, Solano County, an old fifteen-foot concrete slab was widened to twenty feet and thickened, and in western San Joaquin County, an oil macadam roadway, fourteen feet wide, was similarly improved.

The Solano project is located on the trunk highway between the Bay cities and Sacramento, beginning at the east city limits of Vacaville and extending to a point 2½ miles west of Dixon, a total of 8.3 miles. Due to the adobe soil sub base on portions of this section, the existing concrete pavement, placed in 1916, was rough and fast becoming a serious maintenance problem. It also was too narrow to adequately handle present traffic.

The first 2000 feet, immediately east of the city limits of Vacaville, was improved with a second story concrete construction twenty feet wide with nine-inch edges, the edges being reinforced. This type of pavement was used where the highway crosses a low elevation. The remainder of the widening was done entirely with asphalt.

New Methods Developed.

Some features of this work called for the development of new methods. The grade was widened by hauling in new earth from approved borrow pits furnished by the state. Adobe sections were thus covered with a loam soil which has proved preferable as a sub base.

Paving operations began with the trenching out of the earth shoulders on each side of the concrete slab to a width of 2½ feet and to about the depth of the existing pavement. Outside header boards were placed to a true grade regardless of the inequalities of the old pavement, and the trench filled with an asphalt concrete base mixture which was thoroughly compacted.

The contractor developed spreader boxes which received the base mix directly from the trucks and mechanically placed it in the trench with a proper allowance for roller compaction. Following the construction of the shoulders, a leveling course of base mixture was laid over the resulting twenty-foot width, removing both the excess transverse crown and longitudinal irregularities of the old pavement. Over this was placed a 1½-inch top mixture, and lastly a hot asphalt seal coat and hot screenings were applied and rolled in.

Mechanical Spreaders Used.

A feature of the placing of these top courses was the use of two steel mechanical spreaders of the Galion make which were operated a short distance apart, as shown in the illustrations.

A level, attached to the strike-off plate of the spreader, permitted an operator to raise or lower the plate and thus deposit larger or lesser amounts of the mix as required by the irregularities of the old concrete slab. The result was an exceptionally smooth job.

A minimum of separation of aggregates in the asphalt mixture was noted and it is evident there was a considerable saving to the contractor. Three rakers and four shovelers were able to handle, with the aid of the mechanical spreaders, a plant output that ran as high as 400 tons per day.

The contractor also worked out a wooden spreader box for spreading the two-foot crushed rock shoulders, placed at the edges of the completed pavement. The illustrations will indicate how uniformly it was possible to spread the rock by this method.

Corrections in alignment were made and curves were widened and superelevated with a minimum radaii of 500 feet. As there was no superelevation of the old pavement, this improvement was accomplished by building up the outer side of the grade with new loam soil and crushed rock, thoroughly wetted and rolled before the new pavement was placed.

Cost of Solano Improvement.

The total cost of the grading, new drainage structures and pavement widening and thickening on the Vacaville job was approximately $242,500 for 8.3 miles. Force and Currigan, former Oregon contractors, made special efforts to complete the job under unfavorable weather conditions. H. O. Ragan was resident engineer in charge for the state. Grading began early in the summer, paving started August 16th, and the job was finished January 14th.

San Joaquin County Project.

The 8.1-mile project in San Joaquin County, between a point two miles east of Tracy and the Alameda County line, was similar in nature to the Solano County contract, except that in San Joaquin County a county built oil macadam road, fourteen feet in width, formed the base for the new pavement. While the old road had given many years of service, it was inadequate for present traffic and expensive to maintain.

In anticipation of its reconstruction, six-inch waterbound macadam shoulders, four feet wide, were placed on this section during the fall of 1923 and early spring of 1924. These

VACAVILLE WIDENING CONTRACT—Views on the Force and Currigan asphalt contract, Solano County, where a new plan for widening the fifteen-foot concrete pavement with asphalt concrete is being tried out. Upper left, method used to spread asphalt concrete mix in shoulder trench for widening the pavement to twenty feet. Upper right, spreading the two-foot gravel shoulders along completed pavement. Lower views show spreader used in placing asphalt concrete mix over old concrete pavement and new shoulders. Use of labor-saving devices has been a feature of this job. (Div. X.)

shoulders serve as a base for the outer edge of the new surfacing.

The contract for the work was awarded to the Valley Paving Company during July, 1924. The contractor's paving plant was located at Tracy and was capable of producing 400 tons of asphalt concrete mix per eight-hour day. Modern equipment, including mechanical spreaders of the roller type, was used on this project. The contract was completed January 3, 1925. C. O. Dingle was resident engineer.

Shoulders Feature of Project.

A total of 24,470 tons of asphalt mixture were required for the 8.1 miles. The thickness of the new surfacing averages about 2½ inches at pavement center line with a uniform thickness of five inches at the outer edge.

The pavement was placed in two courses; first, a leveling course to remove inequalities in the old oil macadam; and second, a top surfacing of a uniform thickness of two inches with a seal coat of hot asphalt and screenings.

Compacted gravel shoulders along the edges of the new pavement have been the subject of favorable comment. These rock shoulders serve as a protection to the pavement edge and are an added safety factor in that they prevent the tracking of treacherous adobe soil across the highway.

The cost of the work, including the widening of the grade to state highway standards, was approximately $194,000. San Joaquin County has many miles of oil macadam highway, built by the county, which must be widened and thickened before the state highway system within the county can be considered completed.

THE BIENNIAL

We have received a copy of the biennial report of the State Highway Commission and to one who has made a study of the highway question and is familiar with many of the routes it is mighty interesting reading. To the author of that report we extend our sincere congratulations.

—Placerville Mountain Democrat.

CURING CONCRETE WITH CALCIUM CHLORIDE—RECENT CALIFORNIA EXPERIMENTS

By C. L. McKesson, Research Engineer, Construction Department.

ONE of the difficulties attendant upon the construction of concrete pavements in the drier regions of California is the expense of securing water for curing the concrete. It has long been known that calcium chloride, under favorable conditions, will absorb moisture from the air, and, during 1924, a number of experiments were undertaken by the Construction Department of the California Highway Commission in an effort to utilize this chemical as a substitute for the ordinary water method of curing.

Illinois, with a rather high relative humidity and precipitation throughout the year, has reported considerable success by distributing 2½ pounds of calcium chloride per square yard of pavement soon after the concrete is finished.

During last year, the California highway department conducted extensive field and laboratory experiments in an endeavor to ascertain whether this substitute can be used safely in this state in sections where humidity is low, temperature high, and precipitation absent during summer months.

Location of Field Experiments.

Field experiments were conducted on paving jobs in Los Angeles, Ventura, Sacramento and Humboldt counties.

Preliminary experiments, made early in the season, indicate a slight reduction in strength probably would result from substitution of the calcium chloride treatment for the usual water curing. All of the field tests made during the summer bore out this conclusion.

On two of the projects, concrete specimens 6 x 6 x 12 inches were cast from the concrete actually used in the pavement. In each case, half the specimens were cured by placing on one side, the morning after they were made, flake calcium chloride (dry) at the rate of 2½ pounds per square yard of surface. On three jobs, a portion of the pavement was treated in a similar way with calcium chloride and the remainder was cured with water in the usual manner. Upon completion of the work, cores, cured by both methods, were drilled from the pavement and sent the state highway laboratory at Sacramento for test.

Summary of Tests.

The following is a summary of the results and relative efficiency of calcium chloride curing, as indicated by these tests:

Location of experiment	Number of samples	Average compressive strengths				*Efficiency of calcium chloride, per cent	Remarks
		6 x 6 x 12" moulded specimens		4½" cores from pavement			
		Water cured	Calcium chloride	Water cured	Calcium chloride		
Div. X—Sac.-4-B; Sacramento-Stockton highway near Sacramento.	24	-------	-------	4,292	4,218	98	Hot and dry. (Water cured concrete 57 days old; calcium chloride cured concrete 70 days old.)
Div. VII—L. A.-2-BC; Ventura-Los Angeles highway near Calabasas.	32 28	3,064 -------	2,783 -------	-------	-------	91 81	Hot and dry.
				4,057	3,294		
Div. VII—Vent.-2-A; Ventura - Los Angeles highway near Newbury Park.	12	-------	-------	3,491	3,093	88	Hot and dry.
Div. I—Hum.-1-CH; Eureka - Arcata highway at Arcata.	72	3,887	3,545	-------	-------	92	Experiment in October weather; cool humidity high (70-90). Some rain.

*Efficiency of calcium chloride curing assuming water curing to be 100 per cent efficient.

The above tests indicate calcium chloride is from 80 to 90 per cent efficient and that it might be used as a substitute for water curing where water is scarce. Some of the strength appears to be sacrificed, but the cores showed a minimum average strength of better than 3000 pounds in the most unfavorable case, and this strength indicates a fair factor of safety.

More Data Later.

An extensive series of curing tests, not included in the above discussion, was conducted at Sacramento during the summer and fall of 1924 by the California Highway Commission in cooperation with the Structural Materials Research Laboratory of the Lewis Institute. Calcium chloride and many other methods of curing concrete pavements were included in this series, the results of which will be given to the public in a report now being prepared.

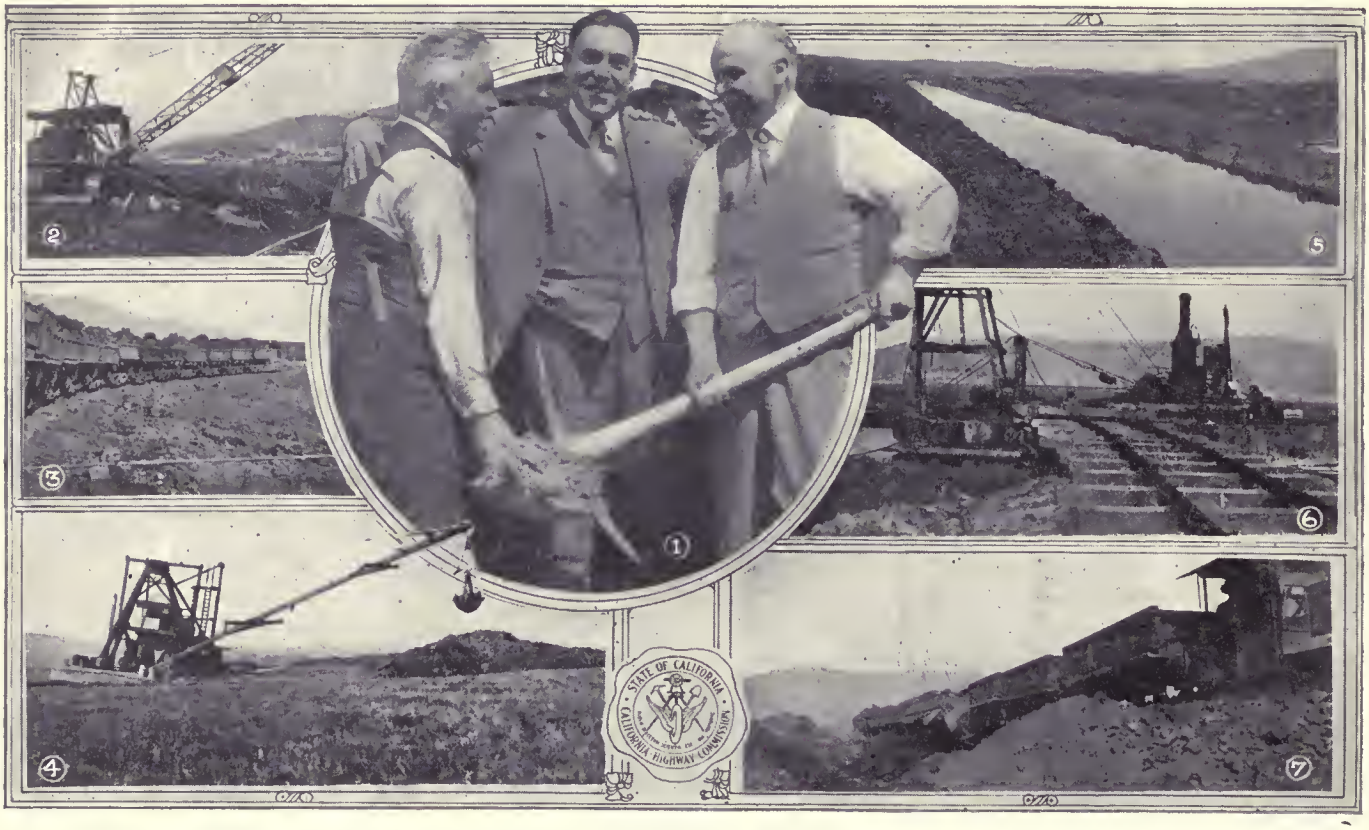
It is possible that the results of these experiments, together with the tests discussed above, will result in some changes in present highway construction methods.

GRAND JURY COMMENDS COMMISSION

THE Inyo County Grand Jury, in a recent report, had the following to say regarding the action of the California Highway Commission in taking over for maintenance the state highway between Mojave and Independence:

> We most earnestly desire to express our thanks and appreciation of the action of the California Highway Commission wherein such commission recently took over, with a view of immediate maintenance and future construction, the highway between the towns of Independence and Mojave, and feel that this commendable action on the part of the California Highway Commission will not only result in the best interest of the State of California, in general, but of the county of Inyo, in particular.

Let us travel over all the countries of the earth and whenever we shall find no facility of traveling from a city to a town, or from a village to a hamlet, we may pronounce the people to be barbarians.—Abbé Reynal.



BAY SHORE HIGHWAY CONSTRUCTION NEAR SOUTH SAN FRANCISCO—(1) The first shovel full of earth at the ground breaking ceremonies; Supervisor Ralph McLaren of San Francisco with the shovel; Mayor James Rolph, Jr., with the pick; Chairman Harvey M. Toy, center; (2) caterpillar dragline leveling fill; (3) trainload of dirt leaving borrow pit at South San Francisco; (4) floating dredge making highway fill; (5) drainage canal, highway fill on right; (6) driving piles with floating driver for pile trestle; (7) constructing highway fill with industrial railway. Funds for this work were supplied by the city and county of San Francisco. (Div. IV.)

CONSTRUCTION WORK UNDER WAY ON BAY SHORE HIGHWAY

STATUTES enacted by the legislature of 1923 (chapter 181, laws 1923) provide authorization of law for the building of a highway in San Mateo County under state supervision with funds supplied by the city and county of San Francisco. Other counties are authorized to contribute funds, but to date San Francisco is the sole contributor to the general fund created by the act, $400,000 having been advanced to finance the work now under way.

The Bay Shore highway, the name by which this project is generally designated, under the terms of the present law, extends from the southern limits of the city and county of San Francisco, along the bay shore, to and through San Mateo County. The initial contract, which was approved by the commission in August, 1924, provides for the grading of a 5.2-mile section between South San Francisco and Burlingame.

Ceremonies Mark Start of Work.

The ground breaking ceremonies took place at South San Francisco on September 11th before a large crowd with Chairman Harvey M. Toy, Mayor James Rolph, Jr., of San Francisco, Supervisor Ralph McLaren and others taking part.

D. A. Foley and Company, of Los Angeles, the contractors, have several types of machinery engaged in building the grade across the salt marshes adjacent to the west shore of San Francisco Bay. The unique character of the project from a highway standpoint is attracting widespread attention throughout the San Francisco peninsula.

The peninsula cities look upon the road as an ultimate solution of traffic problems. It is planned as a wide, commercial highway with no obstructions, sharp curves, or grades of more than 4 per cent. The initial grade is being built sixty feet wide on a 100-foot right of way.

History of the Project.

Only one bid was received when the work was first advertised and it was rejected by the commission in May, 1924, and a revision of the plans undertaken in an effort to lower the cost. Contractors were permitted to submit alternate bids under several different schemes for doing the grading. The change in plans resulted in sixteen bidders and much lower bids. Dredgers are being used to excavate drainage canals through the marsh and an industrial railroad is in service in the construction of the roadway embankment. Material is being secured from Belle Air Island.

The contractor's bid for the first 5.2 miles under the revised plan was $298,610. Culverts and other necessary work probably will bring the cost of the contract to nearly $400,000.

IMPRESSIONS OF THE CHICAGO CONVENTION AND ROAD SHOW

By R. H. Stalnaker, Equipment Engineer.

THE increased attention given maintenance problems and equipment was the outstanding feature of the annual convention of the American Road Builders Association and road show recently concluded in Chicago. The attendance was representative of the country and a number of interesting papers were presented which will be published in the engineering journals.

In connection with the convention, two meetings of the equipment committee of the American Association of State Highway Officials were held for discussion of equipment problems. These meetings also were attended by members of the War Material Board of the Bureau of Public Roads, and the question of the possibility of the distribution of additional surplus war equipment was pretty well threshed out.

Machinery Exhibit Larger.

The road show, held in the Coliseum, was more extensive and better than last year. While the major part of the space was devoted to exhibits of construction equipment, there were many exhibits of purely maintenance equipment; and the displays of signs, traffic signals, warning lights, etc., included a number of new developments.

It was noted that the number of snow plows of various types exhibited is increasing. The display included two rotary plows, one of which had twin rotors driven by an eighty-horsepower six-cylinder gasoline engine, designed for attachment to a tractor similar to the ten-ton Holt or Best Sixty.

A number of well designed gasoline engine driven hoists were shown, and it seems evident this style of hoist has reached the point where it may be depended upon for heavy duty work.

Small Road Rollers Displayed.

Several small road rollers, utilizing the Fordson power plant, were on exhibit. One of them which had a grader blade mounted between the front and read rolls and a well designed scarifier appears to possess considerable merit.

Several new gasoline shovels, including four small shovels, were inspected. However, none of the extremely light shovels, using the Fordson tractor power plant, was seen, and it is understood that at least one of the three exhibited last year has been withdrawn from the market.

In spite of this, however, one of the striking features of the show was the number of different machines which utilize the Fordson tractor. A number of Fordson shovel loaders were on display.

The displays of other tractors, both of the wheel and track-laying types, were exceedingly interesting. A number of new features were in evidence

New Truck Runs Both Ways.

Nearly all the standard makes of motor trucks were represented. One rather interesting development was a truck designed for operation in either direction. While this truck was designed primarily to obviate the necessity of turning around on the subgrade, it undoubtedly has possibilities for use on some shovel jobs.

A number of dump bodies and hoists, both hand and power, were shown. However, outside of the development of some mechanical hoists, there has been little change in these lines.

Manufacturers of graders generally exhibited their products. The outstanding features in this line were the growing popularity of rubber tires and roller bearings, and better provisions for protection of wearing parts, particularly in the control mechanism.

Taking the show as a whole, the outstanding feature in new road building equipment was the great increase in the use of the gasoline engine as a power plant.

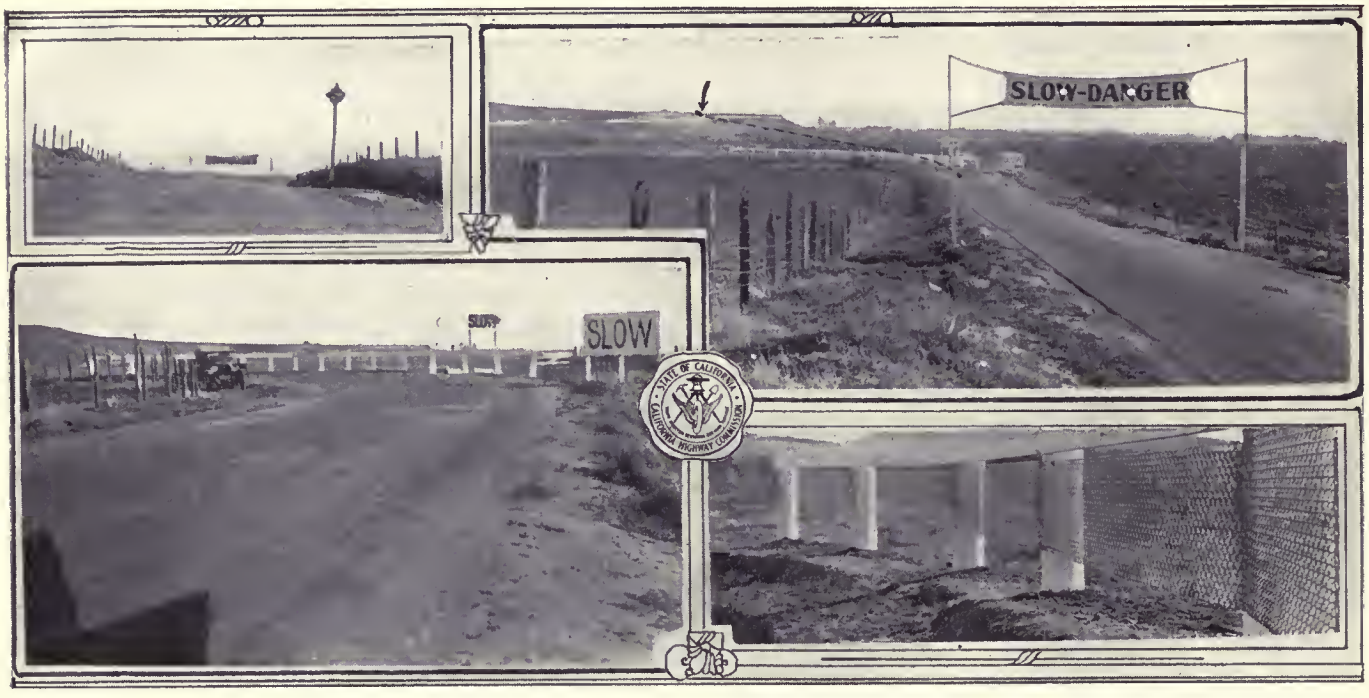
SUPERVISORS APPROVE SUGGESTED POLICIES OF COMMISSION

DISCUSSING future state highway construction, the California Highway Commission, in its recent biennial report, outlines certain changes in policy which it believes desirable when additional funds are provided.

These suggested policies were discussed before the recent convention, in Sacramento, of the County Supervisors Association of California and were approved in the following resolution presented by Supervisor Frank L. Roohr, of Butte County:

> Whereas, The California Highway Commission, in its biennial report for the period ending June 30, 1924, filed with the Governor, proposes, when sufficient funds have been placed at its disposal, to adopt and put into practice the following policies, to wit:
>
> 1. Maintenance of travelable state highway routes whether construction has been commenced or completed;
>
> 2. The design, supervision, and construction of all bridges on the state highway system;
>
> 3. The acquiring of all rights of way necessary for state highway purposes;
>
> 4. The construction and maintenance, to such an extent as may be necessary to serve the traveling public, of highway routes through the smaller cities and towns; and
>
> Whereas, We believe these suggested policies to be proper functions of the state highway commission, embodying the just obligations of the state when the commission is in a position to undertake the additional activities outlined in its report; now, therefore, be it
>
> *Resolved,* By the State Association of County Supervisors, in convention assembled at Sacramento, California, January 16, 1925, that we do hereby approve the suggested policies of the California Highway Commission, as above set forth, and urge their adoption at the earliest opportunity; and, be it
>
> *Resolved, further,* That we commend the California Highway Commission for its constructive attitude toward these problems as manifested in its report.

WARNINGS PLACED IN EFFORT TO STOP DEATH TOLL IN SOUTH



DANGER WARNINGS IN SAN DIEGO COUNTY—Measures taken by Division Engineer S. V. Cortelyou to warn and protect motorists at the sharp curve approaching the San Mateo Creek bridge, northern San Diego County, where many deaths have occurred recently. The dotted line in the view at the upper right shows the new direct line on which the state highway will be built during the coming summer, using gasoline tax funds. All dangerous curves will be eliminated. (Div. VII.)

MORE IMPROVEMENTS FOR SAN DIEGO COAST ROUTE

THE next big undertaking of the highway commission in San Diego County will be the reconstruction of the state highway in the vicinity of San Mateo and San Onefre creeks, in the northern part of the county.

New bridges will be constructed across both streams, a considerable distance nearer the ocean than at present. This will permit a new section of highway to be built, on a straight line across the low lands bordering the mouths of these streams, eliminating the dangerous curves at the approaches to the present bridges.

Division Engineer S. V. Cortelyou of Division VII has been working on the plans for some time and the recent granting of the necessary rights of way by Jerome O'Neill, owner of the property, will make it possible to do the work during the coming summer. Plans for the two new bridges are being finished by the bridge department.

Division Engineer Cortelyou has the highest praise for Mr. O'Neill for his action in granting the new rights of way, which were deeded without cost to the state. Mr. O'Neill also has signed deeds for other line changes in the same vicinity which will add greatly to the safety of the highway.

Pending completion and opening of the new road, Division Engineer Cortelyou has erected large warning signs and a heavy guard fence on the curves at the northern approach to San Mateo Creek in an effort to prevent accidents until the line change is ready for traffic.

Standard guard rail, flashing signal and warning signs on the roadside having failed to eliminate accidents at this point, a special type of fence was constructed, using pile posts and Page Hiway Guard fencing, with a wide wooden rail above the wire to increase visibility. Taking advantage of the brow of a hill on the approach to the curve, a 4-foot by 20-foot canvas sign reading, "SLOW—DANGER," was stretched overhead across the roadway. To approaching motorists this sign appears to be a barricade across the pavement. It is easily visible day or night and results in the checking of speed of vehicles before the sharp curve is reached.

The work planned, including the bridges, will be one of the important reconstruction projects on the commission's southern California program for 1925. It will be financed with gasoline tax funds.

DOWELL BILL PASSES

The Dowell Bill, authorizing the expenditure on the federal aid highway system in cooperation with the states of $75,000,000 a year for the next two fiscal years, passed the United States Senate early in February. It had previously passed the House. Opposition was reported from New York, Pennsylvania and the New England states that argues none too well for the future of the federal aid program.

The bill also carries an authorization of $7,500,000 a year for the next two years for highways in the National Forests.

This is evidently another detour or "Dangerous but Passable" sign:

Rastus: "I see your mule has 'U. S.' branded on his hindquarters. Was he in the army?"

"No, boss, dat 'U. S.' don't stand for 'Uncle Sam,' it means 'Unsafe.'"

WIDENING OF THE PENINSULA HIGHWAY TO BE CONTINUED

WIDENING of the Peninsula highway through San Mateo County, Division IV, inaugurated by the California Highway Commission during the latter part of 1923, will be resumed during the coming spring and summer, when the congestion on the "bottleneck" will be attacked between San Bruno and Daly City.

Plans and specifications are now being prepared for the section between Cypress Lawn cemetery and San Bruno, a distance of 4.39 miles; and studies are being made by Division Engineer J. H. Skeggs of possible solutions of the situation existing in the immediate vicinity of the cemeteries, where improvement is hampered and the highway badly congested by the presence of street car tracks of the United Railroads.

New Pavement Forty Feet Wide.

The San Bruno-Cypress Lawn improvement will conform in every way to the work completed south of San Bruno. Eight-foot concrete shoulders eight to ten inches in thickness will be laid on either side of the present twenty-four-foot pavement and the latter will be resurfaced with several inches of asphalt concrete, making the new pavement forty feet in width. If the situation regarding the car lines on the highway right of way can be worked out, this improvement will be carried northward to Colma.

In Daly City, three-foot concrete shoulders seven inches thick will be placed on either side of the present pavement, extending it the full width of the street to the curb line. This work already has been authorized.

The most recently completed improvement on the Peninsula route was the Freeman and Whiting contract between Redwood City and the southerly boundary of San Mateo County, a distance of 3.46 miles. The old pavement was widened and thickened to a width of thirty feet, and macadam shoulders provide a clear roadway width with a minimum of thirty-six feet. This project cost in excess of $130,000.

Financed from Gasoline Tax.

The contract of the Pacific States Construction Company for the work between San Bruno and Beresford was completed some time ago at a cost of over $300,000. The pavement here was widened to forty feet with an additional width of several feet of macadam shoulder, providing a clear roadway width of fifty feet. The concrete for the shoulders was delivered from a central mixing plant at Burlingame and the asphalt concrete came from a central plant at Belmont.

These improvements have been made necessary by the tremendous traffic which the Peninsula route, the only completed state highway into San Francisco, is compelled to carry. The work is being financed from the state's share of the motor vehicle fees and gasoline tax fund.

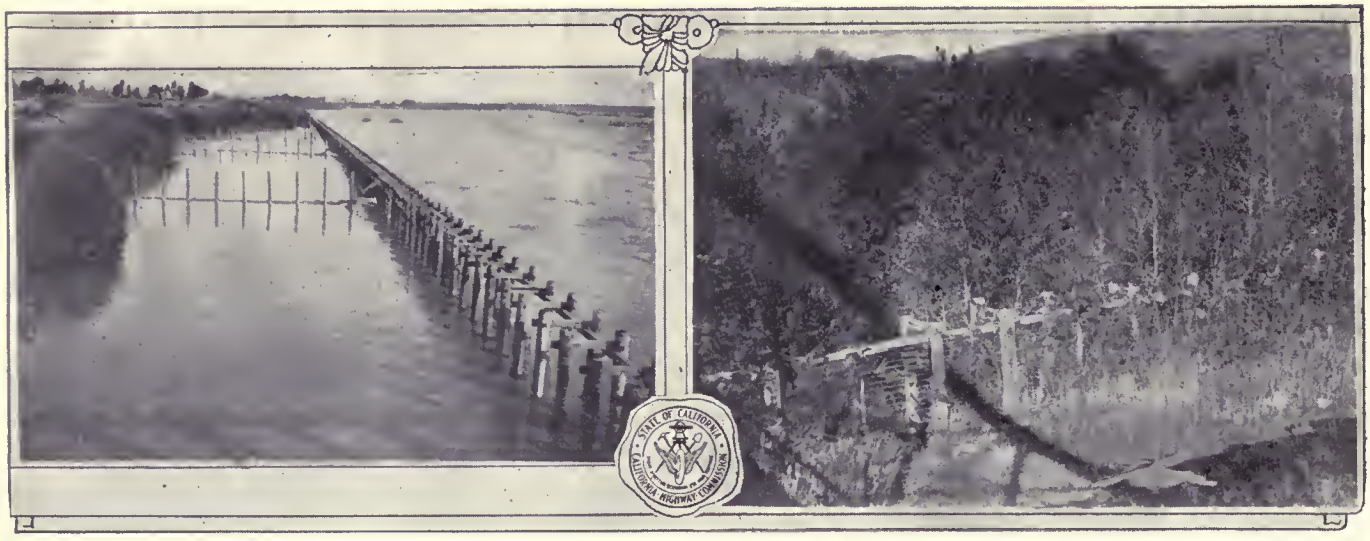
INDIANA HOLDS ROAD SCHOOL

ONE of the unique schools of the country is the Indiana Annual Road School, conducted under the auspices of the Department of Civil Engineering of Perdue University. Attendance upon the part of county road superintendents has been made compulsory by state law. Expenses are paid by the various counties.

The 1925 session, which has just closed, had an attendance of 433 and is declared the largest and best of the eleven so far conducted. The plan is similar to that under which public school teachers attend institutes.

The Indiana school, this year, took up such subjects as construction, maintenance, drainage, equipment and road law. The sessions are closely allied with the extension service at Perdue.

THE WIDENED PENINSULA HIGHWAY—View of the reconstructed state highway through Atherton, San Mateo County, on the San Francisco Peninsula. The old highway has been widened and thickened with asphalt concrete. Waterbound macadam shoulders were placed to protect the pavement edge. A gasoline tax job, Division IV.



PROTECTING THE HIGHWAY FROM FLOODS—Jetty work along the Salinas and Santa Ynez rivers, Division V, to protect the river bank and adjacent state highway bridges from being undermined. The jetty deflects the current away from the bank.

DIVISION V PLAN FOR PROTECTING STREAM BANKS SUCCESSFUL

PROTECTING river banks from erosion during flood times on certain California rivers, where the sandy loam of the banks is easily washed away, has been a difficult problem for property owners, counties and the state highway commission. The necessity for protecting improved state highways along river banks and expensive bridges across streams has resulted in much study of the problem by highway engineers.

Several years ago, the California Highway Commission developed a type of bank protection which has thus far proved satisfactory in overcoming the difficulties experienced with earlier types. Two of the installations of this type of protection has been made in Division V, one at the Santa Ynez River bridge, near Buellton, Santa Barbara County, and the other at the King City bridge, across the Salinas River in Monterey County.

Tree Planting Part of Plan.

The protection consists of a double pile continuous jetty, driven in the river bed, paralleling in a general way the toe of bank. Single pile cross jetties run from this jetty to the bank at 200-foot intervals. On the faces of these jetties heavy barbed wire is fastened at six-inch spacing. The space back of the double jetty is planted to willows.

As will be seen in the above picture of the King City protection in operation, the swirling eddies that proved so destructive to other types of protection work are eliminated, and the bank is efficiently protected.

As the willows attain such growth as is evidenced in the accompanying photograph of the Santa Ynez protection, the forces of nature help increasingly, and the bank protection gains added strength and efficiency with the passage of time.

This is an example of the many maintenance problems of the commission.

COLTON BILL SUPPORTED

THE Colton Bill, pending in congress and proposed as a means of making the federal aid plan more workable, particularly in its application to western conditions, has gained the support of the County Supervisors Association of California and the California legislature.

At its Sacramento convention, the supervisors' association unanimously adopted resolutions urging favorable action by congress, and during the first half of the legislative session, Senate Joint Resolution Number 19, by Senator Roy Fellom of San Francisco, was passed and forwarded to Washington.

The supervisors' resolution reads as follows:

WHEREAS, There is now pending in congress a bill known as the Colton Bill, being H. R. 6133, and

WHEREAS, This bill is of great benefit to all the states of this country in that it permits the federal government to participate in the entire cost of the construction of highways which must be built to a better standard than was at first contemplated when federal aid was initiated for highway construction in the respective states, and

WHEREAS, The passage of this bill will be of great benefit to many of the western states in permitting them to construct transcontinental highways through vast stretches of desert and sparsely settled sections of the public domain; now, therefore, be it

Resolved, That it is the desire of the California Association of County Supervisors, in convention assembled in Sacramento, California, January 14–16, 1925, that the Colton Bill (H. R. 6133) be enacted into law by congress, and we hereby respectfully request the senators and representatives in congress from California to use their best endeavors to secure favorable action upon this measure at the present session; and, be it

Resolved, further, That the officers of this association be and hereby are instructed to send a copy of this resolution to each of the senators and representatives of the state.

MAINTENANCE PROGRAM IN DIVISION III SHOWS RESULTS

By F. W. Haselwood, Division Engineer.

ABOUT three months ago a new program of shoulder maintenance was started in Division III, covering territory north and east of Sacramento, and marked improvement on many roads in the division is now in evidence.

The work is being done in two stages. The first stage, which is about finished, consists of elaborating somewhat on the usual fall grading and building up the shoulders so that two or three feet adjacent to the pavement lies in approximately the plane of the pavement. Sufficient rock to keep the traffic out of the mud is being placed. Ruts, when formed, are refilled with rock and the shoulder is kept smooth with a drag. Work of distributing rock on the shoulders has been in progress for about three months with beneficial results on the Placerville road (Route 11) between Mills and Shingle Springs, where some twelve miles of shoulders already have been covered. As the pavement beyond Folsom is but twelve feet wide, this additional width is exceptionally useful.

Slippery Shoulders Get Rock.

Several miles of slippery shoulders have been covered with rock between the Davis "Y" and Woodland, in Yolo County, and at other places on Route 7. Distribution also is in progress in numerous other parts of the division.

Near Folsom, a quarry waste has been secured, at no cost except for loading and hauling, which has permitted extensive work from limited funds. Near Willows, an economical arrangement has been made for use of the loading equipment and gravel pits owned by Glenn County, and good results are being obtained in this vicinity.

Local Materials Sought.

Where local material is available, it has been used, instead of imported rock at much higher prices, with the idea that as long as the material distributed is likely to be mixed with the earth of the shoulder, quantity is more important than quality. Material passing a one-inch ring is insisted upon, but the percentage of sand is not limited.

Although this program of shoulder work has resulted in temporary inconvenience in a few cases, the general improvement is quite marked; and, while the rock on the shoulders is not as deep as might be desired, it contributes much to the serviceability and safety of the road and can be renewed or increased in thickness as funds are available.

Distribution during wet weather is advantageous since the material packs more readily. The fact that the soil on the shoulder becomes mixed to some extent with the gravel is not serious and, in fact, is expected to make the shoulder more stable and less easily rutted in the summer.

Will Eliminate Past Work.

It is anticipated this plan for shoulder work will eliminate the necessity for most of the fall and spring grading that has been customary, and that the money heretofore spent for these purposes will be used for distribution of additional rock at the appropriate season and for maintaining the shoulder with a drag.

YUMA CELEBRATES COMPLETION OF HIGHWAY ACROSS DESERT

CALIFORNIA and Arizona were to join hands at Yuma on Saturday, February 28th, in celebration of the completion of the grading and surfacing of fourteen miles of California state highway between the Sand Hills and the Colorado River. This improvement of the trunk line through eastern Imperial County is a happy event for California and Arizona, as it marks the culmination of fifteen years of effort for a connection over the most southerly route between the two states.

An exceedingly rough section of the desert, where the former road was only a trail, is now crossed by a graded and crushed rock surfaced highway of ample width that will be appreciated by motorists entering California by way of Yuma.

The interest of the California Highway Commission in completing this, and other interstate connections, was evidenced by the announcement that Chairman Harvey M. Toy, Commissioner Nelson T. Edwards and Secretary W. F. Mixon would be present and take part in the program.

Governor F. W. Richardson, Commissioner Louis Everding and State Highway Engineer R. M. Morton inspected the new work the week previous to the celebration.

Kisselburg, Schmidt and Hitchcock, an Arizona firm, were the contractors. W. M. Ledbetter and Company of Los Angeles are rushing completion of bridges across the main Yuma irrigation canal, an important part of the improvement.

Sure Conviction.

Helpful Small Boy—"I beg your pardon, sir, but your car was stolen about ten minutes ago."

Car Owner—"Well, why didn't you raise an alarm and stop the thieves?"

Boy—"I never thought of that, sir; but it's all right—I took the number of the car."—*Headlight.*

Myers Creek bridge at the foot of the Mountain Springs Grade, Imperial County, on the state highway between San Diego and El Centro.

WHAT THE DIVISIONS ARE DOING

SIXTY INCHES OF RAIN BRING WORST SLIDES IN YEARS IN DIVISION I

A RAINFALL of forty-five inches in the vicinity of Willits and over sixty inches in the Crescent City section has made road patrol and slide removal the chief activities of Division I during recent weeks. Both the railroad and the state highway have been blocked, and only the most strenuous efforts have kept traffic moving north of Willits.

The worst slides have occurred between Willits and Eureka, in the vicinity of Cummings, and along the coast between Requa and Crescent City. Near Cummings, large slides of several thousand cubic yards have completely filled cuts. Maintenance crews are constantly engaged in constructing temporary roadways around these slides. In many places it is not safe to use a power shovel because of the danger of a sudden movement of earth pushing it over the embankment.

In Del Norte County, seven miles south of Crescent City, for several hundred feet the highway has slipped down the mountain side into the ocean. Traffic is being handled over the old road until a new grade can be constructed. Bad slides also are feared on the new grading in the vicinity of Trinidad.

Paving between Eureka and Arcata, delayed due to continued rainy weather, is about done and sometime in March should see the completion of the contract.

DIVISION III REPORTS SEVERAL CONTRACTS COMPLETED DURING MONTH

DESPITE heavy rains, Division III reports several contracts completed and accepted during the month. The grading between Truckee and Boca, 7.3 miles, the first unit of the Truckee River highway, has been finished by Irey and Holden, contractors, but can not be put into use until three necessary bridges are completed. A contract for one of these, the Polaris Crossing, has been awarded, but construction has been suspended during the winter.

Paving of 1.72 miles of the Chico-Orland lateral, near Chico, has been completed and opened to traffic. The recent storm did some damage to this lateral in the vicinity of Mud Creek, west of Chico, where repairs are under way.

Irey and Holden are making fair progress on their grading contract between Boca and Floriston, where a power shovel is being worked double shift with a crew of 21 men.

Wet weather has made necessary suspension of grading operations west of Williams on the Tahoe-Ukiah highway.

Grading Continues.

C. R. Adams has continued operations between Colfax and Gold Run during the winter months and the eight miles of grading is now reported about 50 per cent complete. The commission already has taken over 1.7 miles of the new grade.

A suction dredge has been at work on the fill at the north approach to the American River bridge, north of Sacramento, on the first part of the improvement, which eventually means a ground level road and underpasses under the two railroad lines between Sacramento and North Sacramento. Sand for the fill is being pumped from the American River.

Work of lengthening culverts on the trunk lines through the Sacramento Valley and on several other routes in Division III has been completed. This has permitted removal of short sections of guard rail and the improvement of the appearance of the highway.

Sections of the Chico-Orland lateral in Butte and Glenn counties have been reshaped recently and resurfaced with a layer of fine crushed rock.

DIVISION V TO CONTINUE ROCK SHOULDER WORK SOUTH OF KING CITY

DIVISION V has been authorized to continue the placing of rock shoulders along the highway through the Salinas Valley. The specific section next to be undertaken extends from King City to San Lucas, a distance of some 8.5 miles. Maintenance of earth shoulders through the Salinas Valley always has been a difficult problem because of the sandy nature of much of the soil. Several years ago rock shoulders were built on a ten-mile section south of Salinas and the results indicate the work was well worth while. During the last year and a half, the construction has been pushed southward until the forty-five miles between Salinas and King City have been improved.

These rock shoulders provide a protection for the edge of the pavement, are an added factor of safety, and will be an excellent sub base for future widening when funds are available.

DIVISION VI ACQUIRES SITE FOR FUTURE SHOPS AND HEADQUARTERS

LOOKING to the future, the commission has acquired a site of several acres near Roeding Park, at the northern approach to Fresno, for the construction of division shops and warehouses and a division office building. At the present time, the site is being graded and leveled by Thompson Brothers, contractors of Fresno. Division shops will be the first building erected on the site. It is hoped this may be accomplished during the coming summer.

A second camp is being erected at South Fork on the Yosemite lateral to accommodate a gang of convicts engaged in the construction of the highway through the Merced River canyon. Due to lack of funds, the number of convicts employed on this project is not as large as was planned when the work was first authorized.

The survey and report on the Madera-Yosemite Big Trees road, known as the Wawona route, authorized by the legislature of 1921, has been completed and forwarded to headquarters in Sacramento. The distance covered by the survey is sixty-one miles. The road is not a part of the present state highway system.

CONTRACT AWARDED FOR BIG GRADING PROJECT ON LOS ANGELES COAST

AFTER long delay due to litigation over rights of way, a contract has been awarded by the commission for the grading of the Coast boulevard through the Malibu Ranch on the Los Angeles coast. S. Wright Jewett of Los Angeles submitted the lowest of the nineteen bids offered for 16.1 miles of grading between Las Flores Canyon and Arroyo Sequit. Completion of the work will open a graded road along the coast from Santa Monica to Oxnard.

A special maintenance crew has completed grading approaches to the new Santa Ynez Creek bridge north of Santa Monica and paving is now in progress.

McCray Brothers, contractors on the Corona Del Mar-Laguna Beach grading contract, in Orange County, are now at work on the last mile of their contract. Culvert work on this project is about finished.

Repairing of oil macadam shoulders between Fullerton and Santa Ana is now in progress under the direction of the maintenance department.

A concrete bridge on the Coast highway near Oceanside across the Santa Margarita is being waterproofed by maintenance forces with Petrolastic cement and Stone Tex liquid.

CONTRACT AWARDED FOR BUILDING OF NEW SAN BERNARDINO SHOPS

THE commission has awarded a contract to Houghton and Anderson of Los Angeles for the construction of the new shops to be located on the recently acquired division headquarters site in San Bernardino. A division office building will be a later development.

Paving between Redlands and Beaumont, on the Imperial Valley trunk line, has been begun by Basich Brothers. The seven miles will be paved with cement concrete, twenty feet wide. R. L. Young is resident engineer.

Surfacing the highway for a mile easterly from Westmoreland, Imperial County, has been completed by state forces.

Grading of 2.3 miles of the highway in the vicinity of Barstow, San Bernardino County, is now under way. H. S. Payson is the resident engineer and M. Henning of Los Angeles is the contractor.

DIVISION ACTIVITIES

BIDS ASKED ON TWO RECONSTRUCTION PROJECTS IN DIVISION X

BIDS have been asked on two big reconstruction projects in Division X, the largest jobs in the division for 1925—building of a new bridge across the San Joaquin River at Mossdale and the paving of 11.55 miles of the San Joaquin Valley trunk line from the Stanislaus River to Turners, both in San Joaquin County.

Practically all of last year's contracts in the division have been completed. Another month will see the Suisun-Denverton grading contract finished. Approaches to the Dry Creek bridge, Amador County, have been completed by state forces; likewise, placing of guard posts on fills between Mossdale and Tracy.

A steam shovel has arrived at Jackson and work has been begun on the Jackson-Pine Grove grading contract. R. N. Murdock is the contractor.

Maintenance crews are widening earth shoulders between Banta and the westerly boundary of San Joaquin County.

An order has been issued for the rebuilding of the decks on two bridges over the South Fork of the Tuolumne River on the Big Oak Flat road.

BRIDGE DEPARTMENT NEWS

POURING of the concrete arch has been completed on the new Sycamore Creek bridge, north of Oceanside, on the Coast highway in San Diego County, a part of the reconstruction program.

Construction is progressing rapidly on the two new bridges on the state highway in Glenn County, work on which must be completed before the irrigating season. The bridge on the main highway at the Willows city limits will support a welcome arch, the cost of which is being met by local interests.

Despite high water, work is progressing satisfactorily on the concrete arch bridge over the Van Duzen river in Humboldt County.

Rincon Work to Start.

After many delays due to a shortage of water of a quality which would pass laboratory tests, pouring of concrete on the Rincon seawall, in Ventura County, was scheduled to start February 19th. Machinery and materials are on the job.

The new concrete bridge over the Cherokee by-pass, in Butte County, has been completed and opened to traffic. The structure has been highly commended by users of the highway.

Construction is being rushed on the creosoted pile trestle bridge under construction over the main canal of the Yuma irrigation project in Imperial County. It is hoped the bridge may be completed in time for the celebration of the opening of the new highway between Yuma and the Sand Hills, scheduled for February 28th.

Bids have been asked for the approach to the Ventura River bridge, in Ventura County; San Juan Creek bridge, Orange County; and the Mossdale bridge across the San Joaquin River in San Joaquin County.

MILEAGE UNDER MAINTENANCE GAINS

THE mileage of state highways under maintenance by the California Highway Commission is steadily increasing and now totals nearly 5000 miles. State highway under state maintenance, January 1, 1923, totaled 3926 miles; on January 1, 1924, it had increased to 4550 miles; and at the beginning of the 1925 period it was 4900 miles.

At present there are approximately 1240 miles of designated state highway not under state maintenance. About 260 miles of designated state highways are on routes where there are no existing highways.

A bill is pending before the legislature directing the commission to take over for maintenance, on January 1, 1926, all travelable state highway routes.

TREES PLANTED IN SAN JOAQUIN

WITH the approval of State Forester M. B. Pratt and under the direction of W. E. Glendenning, shade tree expert for the California Highway Commission, 800 black locust and honey locust trees are being planted on the state highway in southern Kern County, Division VI. After considerable study the State Forester has determined that this variety is the most suitable for planting in the arid sections approaching the Grapevine grade, where strenuous efforts have been made by the commission to save plantings made in past years.

Improper planting methods and the selection of unsuitable varieties are given by the forester as reasons for the loss of trees on this section. Mr. Glendenning is confident this will not occur with the new trees now being planted under state direction.

Tree Trimming Approved.

Arizona cypress and Arizona ash have been planted near Tulare, also in Division VI, and some locust trees have been set out between Livingston and Turlock.

Topping of poplar trees lining the state highway between Fresno and Kingsburg, undertaken last year by order of Division Engineer J. B. Woodson, has been approved by the State Forester after an investigation. Complaints, voiced at the time, were made with a lack of understanding of the need for the work, Mr. Pratt said, pointing out that the trees had become top heavy and were a menace to the safety of those using the highway.

The topped trees, he predicts, will have ample foliage next summer, will show a big improvement and will live longer.

DIVISION IV PRAISED IN POEM

Those engaged in public work so seldom receive thanks for their efforts that Division IV was both surprised and pleased recently to receive a lengthy poem written in praise of the widening and thickening work done in the California Redwood Park, in Santa Cruz County. The writer, a resident of the region, graphically describes the work of the engineers in the transformation of the old wagon road into a modern highway by means of explosives and modern power machinery.

The Bulletin regrets space does not permit its publication.

New cement concrete pavement on the Jahn and Bressi contract, in San Diego County, showing center expansion joint. A gasoline tax job.

CALIFORNIA HIGHWAYS

OFFICIAL PUBLICATION OF THE

CALIFORNIA HIGHWAY COMMISSION

SACRAMENTO, CALIFORNIA

HARVEY M. TOY, Chairman;

N. T. EDWARDS and LOUIS EVERDING, Commissioners.

ROBERT M. MORTON, State Highway Engineer.

W. F. MIXON, Secretary.

We are pleased to permit publication of any of the matter contained herein or to loan cuts and this privilege is extended newspapers and periodicals without restrictions.

FRANK B. DURKEE - - - Editor

P. O. Box 1103, Sacramento, California.

Vol. 2. FEBRUARY, 1925 No. 2

JUST AMONG OURSELVES

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HIGHWAY NEWS NOTES

Redding Welcomes Division II.

THE entire staff of Division II and their families were welcomed to Redding by the local Chamber of Commerce, which arranged a get-acquainted luncheon for the highway folks who recently were moved from Dunsmuir. Division Engineer H. S. Comly responded to the welcome of Judge A. F. Ross.

Assistant Cashier Resigns.

Helen A. Edwards, assistant cashier and stenographer in Division III, has resigned to enter the insurance business in Sacramento.

E. L. Craun, Walter Blum and Richard Fifield, rodmen, have been laid off due to the reduction in forces.

Following the completion of the Chico paving contract, F. R. Baker, resident engineer, and H. B. La Forge, assistant resident engineer, have been temporarily assigned to the division office.

W. A. Smith, Division III office engineer, is reported to have joined the ranks of the Sacramento golf fans.

Engineer From Division V Loses Life in Fall Over Bluff.

DIVISION V reports the sad death of B. W. Vinsonhaler, recently chief of party and one of the most popular men in the division. All survey parties in the division having been disbanded for the present, Mr. Vinsonhaler had accepted a position with the Los Angeles County Flood Control Board. In some manner while tramping in the mountains of Los Angeles County, he accidentally fell over a precipitous cliff, at the bottom of which he was found dead.

Earl H. Duclo, bookkeeper in the Division V shops, is the proud daddy of another son who weighed 9¾ pounds upon his arrival recently.

W. P. Marshall and L. G. Marshall, until recently resident engineers in Division V, are now employed by the contractor engaged in the construction of the San Marcos Pass Forest highway in Santa Barbara County.

E. B. Brown is working on rights of way at Santa Barbara.

News From the San Joaquin.

Maintenance Engineer George R. Winslow recently made an extensive inspection trip over the highways in Division VI.

Division Engineer J. B. Woodson recently visited Redding to inspect the new Division II headquarters, for the benefit of similar contemplated improvements at Fresno.

Phillip Boulton and Leslie Tresidder, former rodmen, have been reappointed to the service for reconstruction surveys.

It Was Ever Thus.

HARRY D. JOHNSON, instrument man, and Miss Pearl Fairchild of Oceanside were married January 15th. Harry's friends of Division VII report the cigars were good.

Commissioner Visits Division VIII.

Commissioner Louis Everding recently spent some time traveling over the highways in Division VIII, including the interstate connection at Yuma.

Miss Anne L. Porter, formerly head stenographer with Division VII, has transferred from Los Angeles to the accounting department at San Bernardino.

Transfers to Bridge Department.

M. E. Whitney, assistant resident engineer, has transferred from Division X to the bridge department and is now stationed in the southern part of the state.

R. W. McCrea, draftsman, has left the department to assume a position with a Sacramento automobile agency.

Badger Sees the Slides.

R. S. BADGER, from the office of Maintenance Engineer G. R. Winslow, was a recent visitor to Division I, viewing slide conditions along the Redwood Highway. Piloted by Maintenance Engineer J. J. Stockard, Badger reached Del Norte County after considerable difficulty, but had to return by the valley route.

T. E. Stanton, assistant state highway engineer, and Harlan D. Miller, bridge engineer, accompanied by F. Rolandi, contractor, and a representative of the Bureau of Public Roads, recently were caught in the high water while waiting to be taken across the Klamath River and had to abandon their car for a launch from Requa, which rescued them from the flats on the south side of the river. The car was not recovered for several days.

The division regrets the inconvenience caused the men from headquarters, but is glad they were enabled to experience some typical winter weather in the Redwood country.

Carl Miller, maintenance superintendent in the northern half of Division I, has elected himself "Daddy." There is a new baby daughter in his home.

Frank Merrill, draftsman, has returned from a vacation in southern California.

Headquarters News.

EQUIPMENT Engineer R. H. Stalnaker returned January 26th from a trip to the middle west where he attended the annual convention and road show of the American Road Builder's Association at Chicago and the annual meeting of the Society of Automotive Engineers at Detroit. While in the east, he investigated the snow removal methods of several states, and also visited the shops and equipment departments of the Wisconsin and Indiana state highway departments. Despite the many interesting things he saw, Mr. Stalnaker is glad to be back in California, even if it has been raining nearly all the time since he arrived home.

Chapter Party.

The Sacramento Chapter of the American Association of Engineers held its annual dancing party, supper and vaudeville show at the Tuesday Club on the evening of February 14th. Engineers of the highway department were prominent among those making the arrangements. Frank Richardson, L. V. Campbell, F. H. Cushman, H. D. Stover, R. E. Pierce, and Leigh Shoemaker, composed the committee in charge.

Aviators Organize.

Several members of the headquarters engineering staff have been active in forming the Sacramento Aviation Club, composed of former air service officers and dedicated to the promotion of aeronautics. L. D. Packard, assistant engineer in the bridge department and former First Lieutenant of the air service, has been elected president of the club. A. B. Willitt, also of the bridge department and former Lieutenant, is treasurer. H. N. Harper is also a member of the club.

D. C. Willett, of the bridge department, was glad to get back home from Ventura County recently to visit his new son, who arrived during his absence.

The real modern parent promises his son an auto if he doesn't smoke or drink until he is twelve years old.—*Columbia Record.*

MORTON ON COMMITTEE FOR NAMING AND NUMBERING INTERSTATE ROUTES

STATE Highway Engineer R. M. Morton has been appointed a member of the committee of the American Association of State Highway Officials which will undertake the working out of a plan for naming and numbering the important interstate highways of the United States. The appointment was made by President F. F. Rogers, state highway commissioner of Michigan.

Resolutions approving a national system of trunk line road designations and uniform traffic warnings were adopted at the San Francisco convention of the association. To facilitate the work, bills have been introduced in a number of state legislatures, including California, authorizing state and national cooperation through the Bureau of Public Roads, in the naming and numbering of interstate highways.

Miller on Bridge Committee.

Harlan D. Miller, bridge engineer, has been appointed a member of the committee on bridges and structures of the American Association and his acceptance has been approved by Mr. Morton.

This committee is undertaking the important work of preparing standard specifications for highway bridges which, it is hoped, will be generally adopted and bring about the standardization of state highway structures throughout the country.

Other Appointments.

Equipment Engineer R. H. Stalnaker has been appointed a member of the committee on equipment of the association; C. L. McKesson has been named a member of the research committee and Assistant State Highway Engineer T. E. Stanton has been serving as a member of the committee on maintenance.

The department is pleased with the recognition given California.

THE OL' MAINTENANCE MAN

Eacha time heesa come, my boya Tonee
Heesa reada da magazine toa me.
Me, I noa can reada da Englisha, but,
Tonee, heesa smart, heesa got da great nut,
Heesa learn to reada da book in da school,
An' he read so slick, dat boy is no fool.
An' I tella you dis, da ol' magazine,
Heesa maka me glad, heesa one fina ting.
But Meester Editor, alla da time,
Heesa reada to mea da story or rhyme,
'Bout da brave engineer, or some oder man,
An' not a dam ting 'bout da maintenance man.

Who is ita builda da base so fine,
An maka dis road onea finea line?
Who is it fixa da bridge an da pipe,
An' cutta de grass when he getta too ripe,
An' keep da roada looka so grand'?
I tella you who, it da maintenance man.

Heesa work an da dig wid da pick and da shove
To make onea fine road, deesa work heesa love.
Heesa fixa him so, because, some day, by gar,
Bigga boss heesa come in heesa ol' private car.
If hees lika dat road, heesa wave a da han'
An' a make him feel good, dees ol' maintenance man.
So please Meester Editor, jus' onea time,
When you finds nice place, jus' a stick in da rhyme
You writes so nice an' so sweet and so gran'
'Bout disa son of a gun of a maintenance man.

(W. F. Faustman, Division III.)

WORK OF MAINTENANCE CREW APPRECIATED

C. H. JENKINS COMPANY, INC.
114 Bush Street,
San Francisco, California.

February 7, 1925.

MR. R. M. MORTON,
State Highway Engineer,
Sacramento, California.

DEAR SIR: Last Tuesday night the writer was driving from Sacramento to Marysville, and above Wheatland found the highway covered with water. I want to take this opportunity of saying a good word and complimenting the two gentlemen stationed at the bridge, to help all traffic that chanced to get stuck or in trouble at this point. These two gentlemen, I do not know their names, handled the situation wonderfully, and assured each and every motorist they were there to help them out of trouble.

If you have an honor roll, I would certainly be glad to know that these two gentlemen were put on it.

Thanking you for your force, I beg to remain,

Yours very truly,
(Signed) E. F. GEE.

Editor's Note: Division Engineer F. W. Haselwood reports that the maintenance crew mentioned in the above letter was composed of J. E. Stevens, foreman, E. E. Jasper, employees of Division III. They worked for twenty-four hours without relief.

One-Man Town.

Last spring during the hoof and mouth epidemic there was an elderly "native" stationed as quarantine officer on the California-Nevada line up in Mono County.

An inquiring tourist, while getting his automobile "immersed," engaged the officer in conversation:

"Where do you live?"

"Over at Aurora."

"What's the population?"

"Well, during the big mining days, there used to be five thousand, but now I guess it's dropped down to about three."

"Three what?"

"Well, there's me and ole Charley Anderson, and—and myself, and—come to think of it, Charley died last winter."

Widening the highway with flush concrete shoulders—a view taken immediately west of Fairfield, Solano County, Division X. The bridge at this point also was widened and a new railing erected. A gasoline tax job.

The map above does not show all of the state highways in California but only those included in the federal aid system, representing approximately 7 per cent of the total road mileage of the state, outside of cities.

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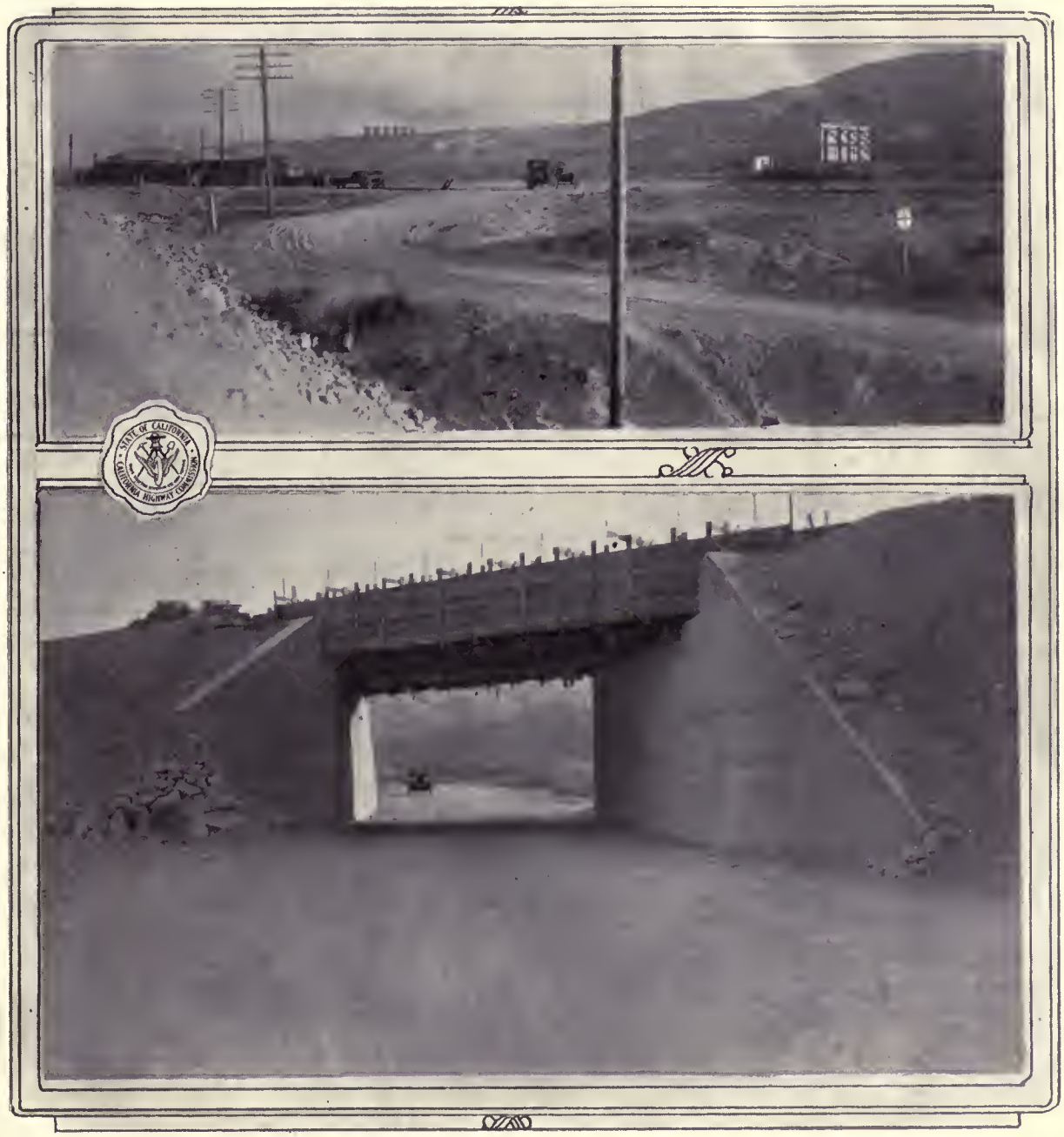

UNDERPASS AT ORO GRANDE ON THE NATIONAL OLD TRAILS HIGHWAY—This splendid new improvement substitutes for a dangerous grade crossing on a sharp curve over the tracks of the Santa Fe railroad a wide underpass. Considerable widening and straightening of the state highway has been done in San Bernardino County in conjunction with similar straightening of the railroad line. (Division VIII.) See article on page nine.

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California Highway Department

California Highway Commission

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L. V. CAMPBELL, Office Engineer

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L. H. GIBSON, Division V, San Luis Obispo

J. B. WOODSON, Division VI, Fresno

S. V. CORTELYOU, Division VII, Los Angeles

E. Q. SULLIVAN (Acting), Division VIII, San Bernardino

F. G. SOMNER, Division IX, Bishop

J. C. McLEOD, Division X, Sacramento

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Federal Aid for Highways Should Be Continued

THE FEDERAL GOVERNMENT has undertaken to aid the states in building a system of main arterial highways for the nation and it is to the interest of every citizen to see that the work is continued. Federal aid has been very largely responsible for the remarkable progress in road construction in recent years. Initiated in 1916, when only a few states were actively improving roads and many of them without a highway department or a definite program for financing or construction, it has been the incentive for the establishment and strengthening of highway departments and the general progressive movement in highway construction.

At the present time a system of approximately 170,000 miles has been designated for improvement with federal aid. This in itself is no small accomplishment since differences of opinion over the selection of highways for improvement are always to be encountered. On November 30th, this year, 36,000 miles had been completed with federal aid and nearly 19,000 miles were under construction. Since 1921 construction has progressed smoothly at the rate of from eight to ten thousand miles a year and additional mileage has been constructed independent of federal aid. It is estimated that about ten years will be required to complete this primary system.

The problem before us is very definite. If we want a complete system of main highways connecting each state of our country, federal aid must be continued. Without its incentive some of the states will lag behind. In some of the western states it is more than an incentive—it is essential that the limited resources of these sparsely settled commonwealths be supplemented by federal aid in order that the main transcontinental roads may be completed.

We have gone too far with this plan to lay down the pick and shovel now. Experience in every state advanced in highway construction shows that the greatest benefit and satisfaction on the part of the public is not felt until the gaps in the main roads begin to close. We are just now beginning to close the gaps in important routes in most of the states.

Experience has shown that the saving in fuel alone makes it cheaper to improve our main roads than not to improve them. Highway traffic has developed far beyond anything anticipated a few years ago. There is not a community in the country which does not or will not derive benefit from improved highway transportation. In the months of heaviest traffic the motor vehicles alone of the country travel a daily average of 300,000,000 miles. A very large proportion of this traffic is concentrated on the routes of the federal aid highway system and since the need already exists construction should proceed as fast as resources in the shape of labor and materials permit.

Having been largely instrumental in bringing about federal aid to highways, the American Automobile Association will use every legitimate effort to expedite the completion of this great system which, when finished, will be a third greater than the national highway systems of all the other nations in the world combined.

AMERICAN AUTOMOBILE ASSOCIATION

GOOD ROADS BOARD
Richard Haldeman, *Chairman*

THOMAS P. HENRY,
President

SNOW REMOVAL KEEPS PACIFIC HIGHWAY OPEN DURING WINTER

SCENES IN SISKIYOU COUNTY DURING RECENT WEEKS—Upper left, state highway snow plow bucking drifts; upper right, a close up view of the equipment in service; lower left, equipment in action; lower center, paved highway in vicinity of Mount Shasta City cleared of snow; lower right, snow removal on a rock surface highway in cooperation with county. View taken on Fredonia Pass, Susanville lateral, Lassen County. Gasoline tax money removes the snow. (Division II.)

STUDY OF SNOW CONDITIONS ON STATE ROADS IS UNDERTAKEN

IT IS PROBABLE that more systematic snow removal work has been done on the state highway system, particularly in Division II, during the past winter than at any other time since improvement of the system made such work possible or practical.

The most important work of this kind was the clearing of the Pacific highway in the vicinity of Weed and Mount Shasta City, although drifts were removed from the pavement at numerous places north of Dunsmuir. The past winter also witnessed the extension of the snow removal program to the Susanville, Alturas and Weaverville laterals.

The state highways from Redding to Weaverville and from Redding to Alturas were kept open during the entire winter. The Susanville lateral between Susanville and Westwood, through Fredonia Pass, was open most of the winter, the state furnishing the equipment and the county doing the actual work.

Division VIII also has done some snow removal work on the highway from San Bernardino into the Big Bear Lake country.

Woodland Man Sends Pictures.

The photographs of snow removal work on the Pacific highway, reproduced above, were sent Secretary F. W. Mixon by H. W. Laugenour of Woodland, accompanied by this note:

> "FRIEND FRANK: Just made a few pictures of your snow plow and its work. Am sending you a set so you will know your boys are going to it and doing good work."

Heretofore, snow removal has been charged to general maintenance. Beginning this winter, the cost of this work is being determined as a separate item for future consideration.

Studies of snow conditions throughout the state highway system were inaugurated during the recent winter and within a few years much snow data will be compiled. The equipment department is doing its share by keeping in close touch with all the latest snow removal equipment on the market and methods in use in eastern states where snow removal from hard surfaced pavements has become an annual winter program in many places.

OUTSTANDING PAVEMENTS COMPLETED UNDER THE 1924 PROGRAM

By Earl Withycombe, Assistant Engineer, Construction Department.

RESULTS obtained with all types of pavements constructed in 1924 reflect considerable well earned credit to the field men of the California Highway Commission in their efforts to secure a stronger and better product.

Quality of newly constructed pavements is judged largely by laboratory tests of samples of the finished product and by field surveys of the condition of the project, during and after construction.

The laboratory, at all times, exerts a rigid control over materials used in the building of the highways and their suitability for pavement construction is determined prior to delivery on the job. Specimens of the finished mix, as it is ready to be incorporated into the pavement, are forwarded daily to the laboratory and the analyses of these samples are returned to the resident engineer as quickly as possible with comments attached for guidance of the field men in the control of ingredients.

What Tests Are Made.

Asphalt mixtures are analyzed for grading of aggregate, quantity and quality of asphaltic cement and density of the mixture. Cement concrete mixtures are tested for compressive strength of specimens at the age of ten and twenty-eight days. The ten-day breaks are for the immediate guidance of the field men, and are a preliminary indicator of the ultimate strength to be expected. The twenty-eight day breaks are accepted as the true indicator of the ultimate strength.

The weight per cubic foot of the specimen is determined to indicate the density of the concrete and any apparent oversanding or overwatering of the mixture is noted on the laboratory report. These construction specimens of both asphaltic and cement concrete are frequently augmented by samples cut from the completed work, subsequent to construction, and a recheck made of the completed project.

Field surveys are made under the direction of headquarters and consist of inspection during the course of construction and subsequent conditional surveys to determine the action of the pavements under traffic.

Vialog Makes Graphic Check.

The riding qualities of pavements are determined by a graphic chart of the surface irregularities as recorded by the Vialog, a device recently adopted by the department for measuring the roughness or smoothness of road surfaces.

This interesting little machine is installed in a touring car. Its two indicator arms, operating pencil points over a moving graph, are directly connected to the two front springs of the automobile and spring deflections caused by irregularities in the pavement surface are automatically recorded. The graph is driven from a gear connected with a speedometer cable, and in addition to this graph, an indicator records the summation of spring deflections in roughness units.

Vialog records are taken during construction as a guide for the betterment of the work and again at completion as a permanent record. Subsequent records will be made at intervals to determine the performance of the pavement under traffic.

Conditional surveys of concrete pavements are made shortly after the project is thrown open to traffic and a chart made of all transverse and longitudinal cracks. This survey will be progressive from year to year and developments noted.

In order to procure a uniform cement ratio, cement concrete is being proportioned by the relation of a specified number of sacks of cement to a cubic yard of mixed concrete, rather than the relation of the volume of cement to the volume of fine and coarse aggregate. This relation of cement to mixed concrete is varied by altering the proportion of either the fine or coarse aggregate, and, on work where aggregate gradings fluctuate at short intervals, considerable care must be exercised to avoid an under or over run of the cement content. The efficiency of the inspection is judged largely by this feature.

The Best Pavements of 1924.

Of the cement concrete pavements constructed during 1924, the low record of 8.9 inches of roughness per mile was made on Contract 435. Other projects went as high as

(Continued on page 7.)

NEW STATE HIGHWAY BRIDGE OVER THE VAN DUZEN RIVER, HUMBOLDT COUNTY—This magnificent structure, 734 feet in length, is a Redwood highway improvement thrown open to traffic during March. It takes the place of an old county-built bridge which long ago became inadequate for traffic. At the left, is the temporary pile bridge constructed as a detour to handle traffic during construction. The railroad bridge, which parallels the state highway structure at this point, has been blocked out of the picture which was taken during a recent flood. (Photo by Paul D. Towne, Ferndale.)

REMOVAL OF SLIDES ON REDWOOD ROUTE TO COST $100,000

WHAT HEAVY RAINS HAVE DONE TO THE REDWOOD HIGHWAY—Upper left, "The big slide," view in Del Norte County, where several hundred feet of the highway has been entirely swept away; upper right, most of the roadbed gone, traffic still being maintained; lower left, a section of the highway slowly sinking; lower center and right, entire trees and huge boulders slide into the road. Gasoline tax money will remove these slides.

STRENUOUS WORK OF MAINTENANCE FORCES KEEPS HIGHWAY OPEN

AN EXPENDITURE of $100,000 of maintenance funds will be necessary to remove slides and make repairs on the Redwood highway in Mendocino, Humboldt and Del Norte counties. This is the estimate of Division Engineer T. A. Bedford after a survey of the serious damage done by the torrential rains that have been falling during the winter months in the northwest coast counties.

The rainfall for the season at Willits is now 50 inches, while in many sections of Del Norte County it has reached 70 inches. And the end is not yet.

Slides in Division I, to the middle of March, numbered 150. Twenty-seven large trees, some of them up to ten feet in diameter, had fallen across the highway, requiring much labor and powder to cut and blast a roadway of sufficient width to permit traffic to get through.

150,000 Cubic Yards in Slides.

On March 15th, Mr. Bedford estimated the slides had reached a total of 150,000 cubic yards, with more coming in after each rain. At that time, he had three power shovels and every available maintenance man at work clearing the roadway. These strenuous efforts are keeping the Redwood highway open to traffic throughout its entire length, at least a part of each day.

The Division Engineer has the highest praise for the maintenance crews and the valiant fight they are making to keep traffic moving.

Many of the slides in the Redwood section are the worst in years. In places, the entire roadbed has been carried away; in others, huge boulders and trees of great size, loosened by the continued rains, have crashed down mountain sides completely filling the highway.

Unique Methods Used.

Removal of slides is being handled economically in some places in the division by making use of available water and sluicing the earth in the slides across the highway. In one place, a giant monitor, such as was used in early day hydraulic mines, is being operated effectively in slide removal work at low cost.

While the situation is difficult, it is viewed as a part of the job and the work of clearing away the debris and repairing the damage goes steadily forward.

Engineer Reviews Outstanding Paving Projects of 1924

(Continued from page 5.)

30½ inches. Contract 435, which also carries the best average compressive strength for a Class A pavement, is 3.52 miles of 20-foot concrete pavement constructed in Orange County between Huntington Beach and Corona Del Mar, C. P. Montgomery, resident engineer.

The low average for asphaltic concrete was obtained on Contract M42, being 17 inches per mile. Other work for the season ran as high as 37 inches. Contract M42 is 2.78 miles of asphaltic surface on concrete base in Los Angeles County, Pasadena Avenue to Montebello, on the Whittier boulevard. H. C. Reeder, resident engineer.

An average compressive strength of 3950 pounds per square inch for 28-day specimens of cement concrete was obtained on Contract 435. Other projects went as low as 2680 pounds per square inch. Of Class A concrete shoulder work, Contract M54 carries an average of 4200 pounds per square inch and other work went as low as 3310 pounds. Contract M54 is 3.96 miles of flush concrete shoulders in Solano County, Rockville to Fairfield. F. C. Hewitt, resident engineer.

Cement Control.

Totals for the accumulative daily over and under runs of sacks of cement, expressed in percentages of the theoretical amount to be used on the project, is used as a basis for comparing the efficiency of cement control. The low variation of 1.2 per cent was obtained on Contract 431, and for other pavement work ran as high as 2.9 per cent. Contract 431 is 9.88 miles of Class A concrete pavement in Shasta County, Redding to Bayha. B. H. Henry, resident engineer. Of the flush concrete shoulder projects, Contract M54, in Solano County, has the low cement variation of 1.4 per cent.

Of the pavement surveyed to date, Contract 435, in Orange County, has the low average for contraction cracks, having 37 joints and cracks per mile. Other pavements have as many as 200 per mile.

The best progress made on cement concrete pavements for the year was on Contract M39, Los Angeles County, where 21,787 cubic yards of concrete were placed in 110 days or a daily average of 198 cubic yards. Geo. H. Oswald of Los Angeles was contractor.

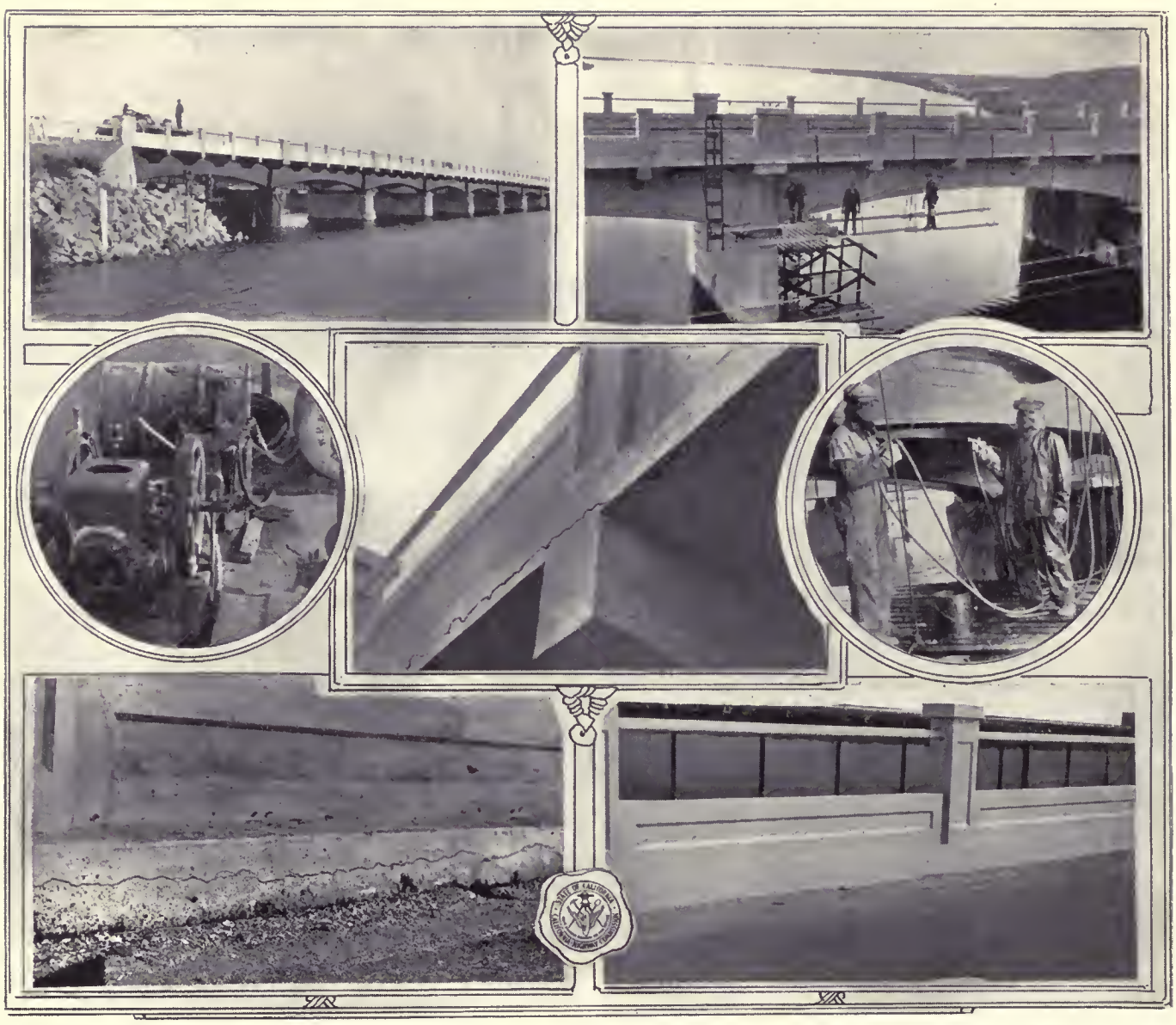
The best progress on asphaltic concrete pavements was on Contract M56, San Joaquin County, where 24,400 tons of asphaltic concrete were laid in 100 days, or an average of 244 tons per day. The Valley Paving and Construction Company of Visalia were the contractors.

OUTSTANDING CONCRETE PAVING IN 1924.

Contract number	Location	Contractor	Resident engineer	Average strength of concrete at 28 days, pounds	Vialog index of roughness; units per mile	Cracks per mile	Average yardage placed per day	Average variation in cement used per day, per cent
435	Huntington Beach to Corona Del Mar	W. F. Beal	C. P. Montgomery	3,950	8.9	37	107	1.3
431	Redding to Bayha	Kaiser Paving Company	B. H. Henry	3,340	12.2	124	167	1.2
433	Beltane to Schellville	Galbraith and Janes	N. H. Nelson	3,230	15.4	200	147	1.6
M-39	Shoup Avenue to Westerly Boundary	Geo. H. Oswald	C. N. Ainley	3,220	30.6	136	198	1.9
M-36	San Diego to Oceanside	Jahn and Bressi	A. N. George	3,530	15.9	51	161	1.6
	Flush Concrete Shoulders.							
M-52	Greenville to Livermore	W. A. Dontanville	M. C. Fosgate	3,310	------	------	60	2.2
M-54	Fairfield to Rockville	Tibbals, Percival and Cress	F. C. Hewitt	4,200	------	------	32	1.4

OUTSTANDING ASPHALT SURFACING—1924.

Contract number	Location	Contractor	Resident engineer	Vialog index of roughness; units per mile	Average specific gravity	Average daily tonnage
M-44	Vacaville to Batavia	Force and Currigan	H. O. Ragan	35.8	2.43	194
M-56	Westerly Boundary—Banta	Valley Paving and Constr. Co.	C. O. Dingle	28.8	2.43	244
M-41	Coyote Creek to Milpitas	Federal Paving Company	E. J. Brown	23.2	2.54	143
M-42	Pasadena Avenue—Montebello	Geo. H. Oswald	H. C. Reeder	17.3	2.37	98



WATERPROOFING THE SANTA MARGARITA BRIDGE ON THE COAST HIGHWAY NORTH OF OCEANSIDE—Methods used to protect a concrete bridge in San Diego County from moisture and the salt air of the nearby ocean. Upper left, girders after application of Petrolastic cement; upper right, men at work and type of scaffling used. The center views show cracks in deck of the bridge caused by expansion of rusting steel reinforcing rods and the paint spraying machines used in applying cement; lower views, cracks in wheel guard and railing caused by rusting of reinforcing steel and the same rail after painting with Stone Tex damp proof paint. Existing cracks were filled with Stone Tex crack filler.

Waterproofing a Reinforced Concrete Highway Bridge

By E. T. Scott, Maintenance Superintendent, Division VII.

THE APPEARANCE of numerous cracks in the girders, deck and railing of the Santa Margarita River bridge on the Coast highway, north of Oceanside, San Diego County, made it necessary to waterproof this structure to prevent further deterioration.

Located on the ocean front and spanning tide water, the Santa Margarita bridge is at all times subject to moisture and salt sea air. These penetrated the concrete, causing the reinforcing steel bars imbedded in the structure to rust. The formation of a coating of rust on the reinforcing steel resulted in tremendous swelling, due to the increased volume of rust over that of steel. The breaking and cracking of the concrete, which is not of the quality now required on state highway bridges, was the result.

After a careful investigation, it was found advisable to waterproof the bridge in its entirety. Visible portions of the structure were painted with Stone Tex, a damp-proof paint with a dull-toned finish, a close counter-part of concrete. Girders and the under part of the bridge were treated with petrolastic cement, an air blown asphalt having more elasticity than steam blown asphalt.

How the Work Was Done.

Petrolastic cement was applied with a paint spraying outfit, operating two "Crown" air brushes. The air brush work was done first to avoid the possibility of spattering with the black petrolastic cement any of the hand-painted surface.

(Continued on next page.)

Dangerous Grade Crossing Eliminated on Old Trails Highway

IN COOPERATION with the Santa Fe railroad, Division VIII has just completed an important improvement on the National Old Trails highway near the town of Oro Grande between Victorville and Barstow, San Bernardino County. Some three miles of the state highway have been straightened out and graded and a dangerous grade crossing eliminated by the building of an underpass, as illustrated in the views on the front cover.

Many accidents have occurred at this point in recent years. The railroad crossed the highway after rounding a sharp curve, and likewise the highway approached the railroad on a sharp turn that entirely concealed the tracks.

Cooperated With Railroad.

The Santa Fe Company has been straightening out and double tracking its lines between Los Angeles and the east and an understanding was reached between the commission and the railroad that whenever the work was done in the vicinity of Oro Grande, the state highway would be graded at the same time. The highway followed the winding course of the railroad and crossed it on the curve as described above.

The cost of the underpass, which was built by the railroad company, was shared by the railroad and the state. This expenditure and the three miles of grading being entirely new construction was financed from the state highway fund. Both the railroad and the traveling public will benefit from this important improvement.

WATERPROOFING A REINFORCED CONCRETE HIGHWAY BRIDGE

(Continued from page 8.)

In order to obtain the proper consistency for application, the petrolastic cement (received in wooden barrels) was first thinned by heating, and to it added a liquid thinner composed of 75 per cent Mineral Spirits and 25 per cent Benzole. The use of two parts of petrolastic cement to one part of liquid thinner gave the best results.

On most of the bridge, one coat of petrolastic cement was sufficient to fill the cracks and pores in the concrete surface. However, there were several areas that absorbed the paint to such an extent that a second coat had to be applied. Treating with the petrolastic cement resulted in an uniformly smooth and tough waterproof coating. The paint was applied at the rate of approximately ⅜ gallon per square yard (gross).

Men operating the air brushes stood on staging mounted on a raft which floated under the bridge and was easily moved from place to place. On three spans on the southerly end of the structure, the raft could not be used because of old submerged piles close to the surface of the water. Here a scaffolding was suspended from hooks hung over the bridge railing on each side of the structure.

The piers, not requiring waterproofing, were covered with canvas to prevent their being spattered by the air brush spraying.

Special Filler for Cracks.

Stone Tex damp-proof paint was applied to the railing and sides of the bridge deck in two coats with hand brushes, after cracks larger than hair cracks had been filled with a special crack filler manufactured for use in connection with Stone Tex paint. For the first or primary coat, the paint was thinned with a special Stone Tex liquid in the proportion of one gallon of liquid to five gallons of paint, and was brushed well into the pores of the concrete.

The first coat of paint was allowed to dry three days and then a second coat of the paint without the addition of the thinner was applied. A gallon of paint covered (two coats) about ten square yards of concrete.

Besides waterproofing the concrete, the paint which has a color approximating very closely that of concrete, has improved the appearance of the bridge.

The painting of the San Luis Rey River bridge at Oceanside with Stone Tex paint, and the spraying with air brushes of the girders and under portion of the Agua Hodienda Creek bridge with petrolastic cement is now in progress.

E. G. Brassington, maintenance foreman, is in charge of the work.

IMPROVING THE FAMOUS "RIDGE ROUTE"—Calahan line change on the Ridge Route, Los Angeles County, showing how maintenance forces of Division VII have reduced seven sharp curves to two with easy radaii. The line shows the center of the highway as it will exist after paving is completed, following settlement of cuts and fills. The gasoline tax provides the funds for this kind of work.

OPENING OF COAST HIGHWAY UNIT CELEBRATION IN SOUTH

AT LAST the barriers which have made it necessary for motorists to travel many miles out of their way in going from Long Beach to Huntington Beach and Newport have been removed and the new pavement and new bridge over Santa Ana River are now open to traffic.

On Saturday, March 21st, the dedication of the bridge took place with Commissioner Nelson T. Edwards officially removing the barrier. Officials of Orange County and of the beach cities joined with representatives of Los Angeles and the Automobile Club of Southern California in celebrating the event.

The city of Newport entertained at a luncheon at the Newport Harbor Yacht Club in celebration of the event.

Both north and south of the new section, construction is under way on the Coast boulevard and the day will come when there will be a continuous pavement all the way along the ocean front from Oxnard to Serra.

The new Santa Ana River bridge was built by Orange County under the joint state and county supervision.

ENGINEER FOR SOUTHERN CLUB PRAISES DESERT MAINTENANCE

DIVISION VIII is in receipt of the following letter from E. E. East, Engineer for the Automobile Club of Southern California, regarding maintenance work being done on the desert sections of the Mecca-Blythe route:

LOS ANGELES, CAL., February 26, 1925.

MR. E. Q. SULLIVAN, Division Engineer,
California Highway Commission,
San Bernardino, California.

MY DEAR SULLIVAN: Again permit me to congratulate you upon the very excellent results which you have been able to obtain through maintenance in your division. In this particular case, I refer to the Mecca-Blythe road.

For your information, will say that I made the trip from Mecca to Blythe recently in three hours and thirty minutes; the return trip was made in the same time.

This is good work, keep it up.

Yours very truly,

AUTOMOBILE CLUB OF SOUTHERN CALIFORNIA,
(Signed) E. E. East, Chief Engineer.

COOPERATION IN TREE PLANTING AND CARE IS COMMENDED

The commission has received the following letter from the Red Bluff Woman's Improvement Club:

RED BLUFF, CALIFORNIA, March 2, 1925.

California Highway Commission,
Sacramento, California.

GENTLEMEN: We thank you for the great assistance and service you have rendered the Red Bluff Woman's Improvement Club in enabling them to plant the avenue of trees between Red Bluff and Corning, and also thank you for taking such excellent care of them. Without your aid and help, it would have been impossible for the Committee to have planted the eighteen miles of trees.

The avenue is already attracting the eye of the public.

Most Cordially,

(Signed) MRS. M. ANDREW SCOFER,
MRS. J. F. ELLISON,
Chairmen, Tree Committee.

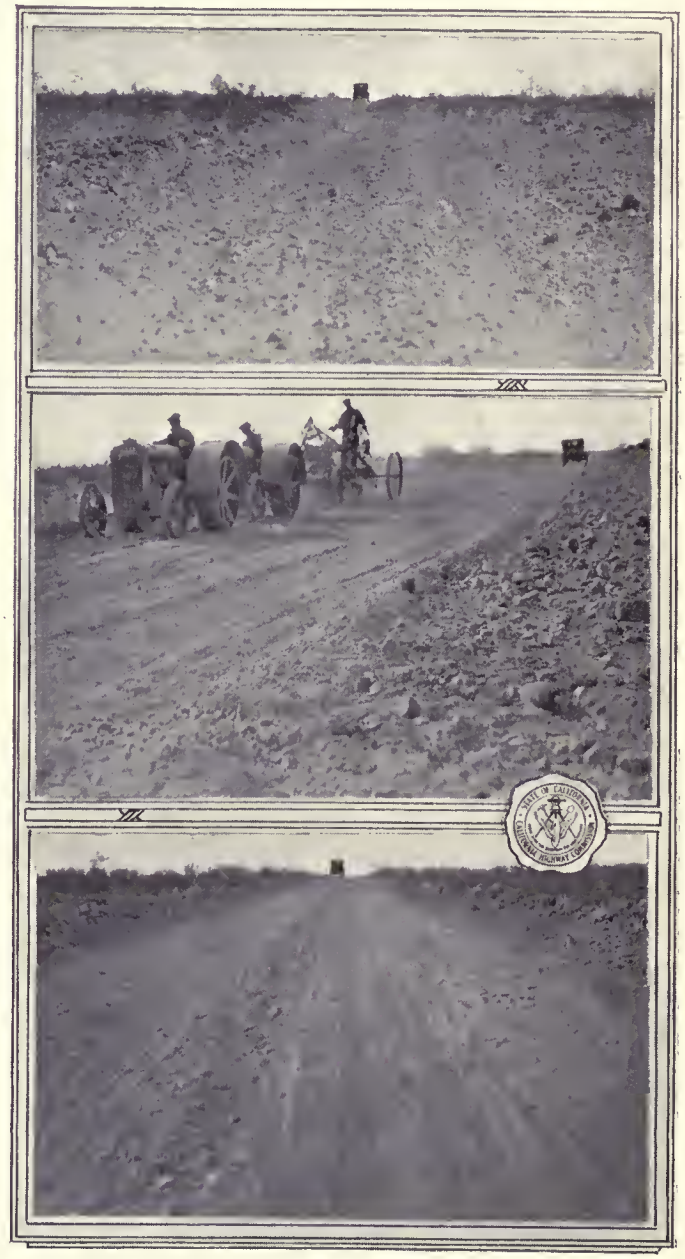
FROM THE LETTER OF A PRISONER

The following is quoted from the letter of a prisoner in one of the road camps, addressed to Superintendent Ben H. Milliken:

> "With regard to the road camp, I can say that any man who could not make good here would be the type of a man who could not behave properly at his mother's funeral."

Herodotus tells of a road built 4000 B. C. It was in Egypt and reached halfway across the African continent. It required 10,000 men working ten years to build a single half mile of it. The stone for the Pyramids was hauled over this road.

In the ancient civilization of Peru streams were bridged and strong stone roads were built. Shade trees and sweet-scented herbs were set along the borders of the road, and at intervals, signs were erected for the direction of the traveler. Inns were built every twelve miles—a day's journey.



IMPROVING THE HIGHWAY ACROSS THE DESERT—Scenes on the National Old Trails Highway between Barstow and Needles, San Bernardino County, where Division VIII is doing extensive maintenance work. Above, the road as it was a year ago; center, state highway equipment in action; below, the road after a year's maintenance.

An Appreciation of Highway Building

From a statement by officials of the West Coast Transit Company, Inc., in connection with an application to the State Railroad Commission for permission to reduce motor stage fares between San Francisco, Eureka and Crescent City, via the Redwood highway.

APPLICATION for general reduction in passenger fares, to become effective April 1st, is being filed with the State Railroad Commission by the West Coast Transit Company, Inc., operators of Redwood Highway Stages between San Francisco, Eureka and Crescent City.

The principal reason for this action is the *reduced cost of operating passenger motor coach equipment,* made possible by the thorough work of the *California Highway Commission* in generally improving the condition of the Redwood highway between San Francisco and the Oregon line.

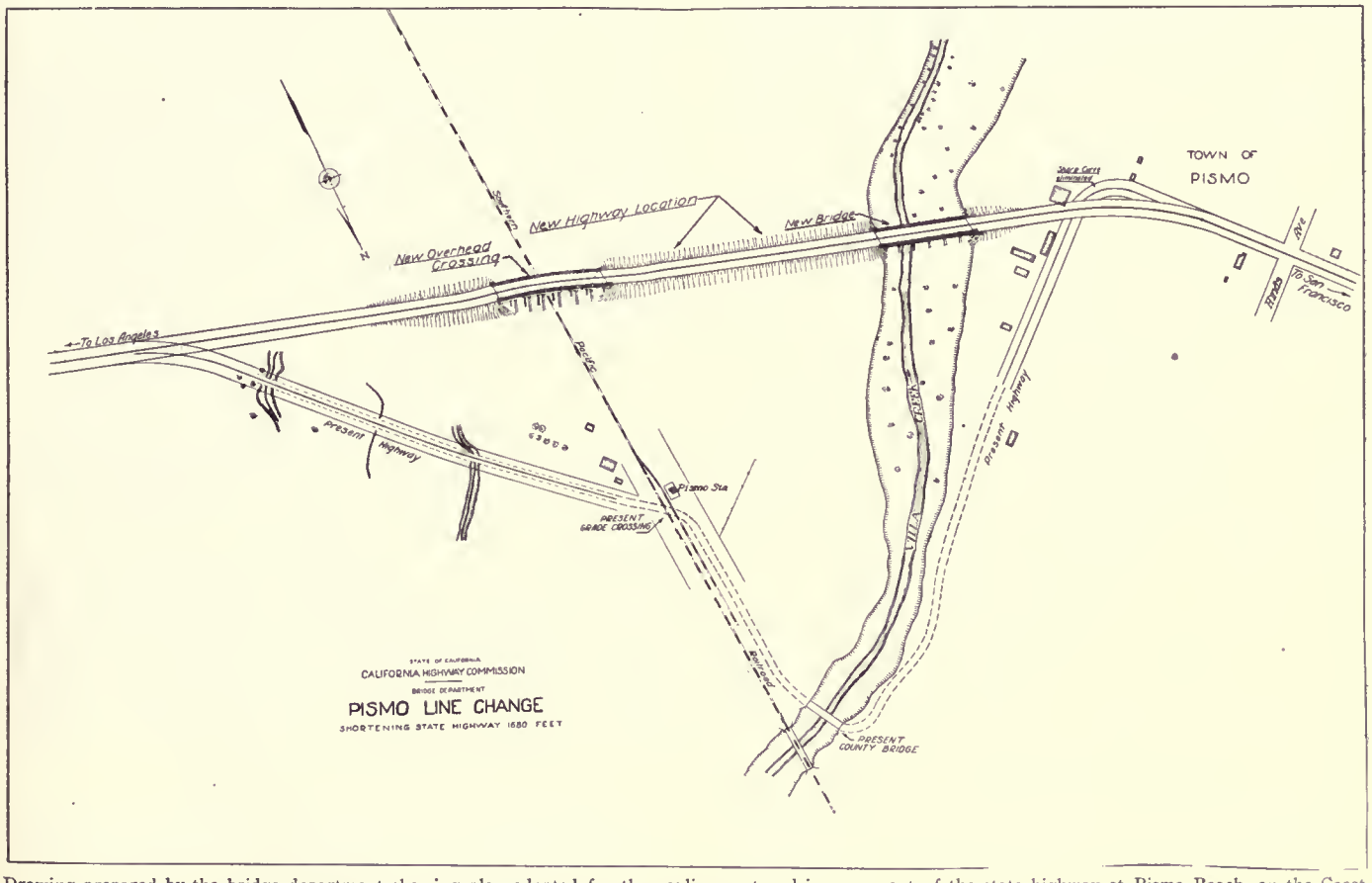
Similarly, improvements carried out by the several counties and the United States Forest Service, on the highways within their respective jurisdictions, has brought about a reduction in operating costs—particularly on the lateral routes of the system between Eureka, Red Bluff, Redding and Yreka.

The programs of these various bodies are rerouting portions of the highway, eliminating curves, widening and bettering the roadbed, *according to the company's cost sheets,* have proved important factors in reducing maintenance, depreciation, tire, fuel and other kindred operating expenses.

The new routing through the canyon above Willits, following the Eel river for over sixty miles almost to Eureka, winding in and out of the many groves of giant redwoods, opens up an attractive water level route which is constantly being improved by the Highway Commission. The new bridge across the Klamath River near Requa, now under construction, will save time and money in the operation of both through and local schedules.

This general reduction in operating cost the West Coast Transit Company proposes to pass along to the traveling public in the form of reduced one way and round trip fares.

THE PISMO LINE CHANGE—AN EXAMPLE OF MANY SIMILAR IMPROVEMENTS URGENTLY NEEDED ON THE STATE HIGHWAY SYSTEM



Drawing prepared by the bridge department showing plan adopted for the realignment and improvement of the state highway at Pismo Beach, on the Coast route, San Luis Obispo County. Sharp curves and a grade crossing will be eliminated. The work is planned for the coming summer.

WHAT THE DIVISIONS ARE DOING

MODERN PAVEMENT NOW CONNECTS CITIES OF EUREKA AND ARCATA

AFTER many delays due to continued and heavy rains during the period of construction, placing of a 20-foot concrete pavement along Humboldt Bay, between Eureka and Arcata, Humboldt County, in Division I, has been completed and will be open to traffic about April 1st.

The construction department reports remarkable results in the placing of this pavement. Laboratory tests show the compressive strength of the concrete probably in excess of any other pavement on the state highway system. Vialog tests will be made shortly and will show an exceptionally smooth riding surface.

J. F. Knapp of Turlock was the contractor on this project. The resident engineer was H. C. Ingle, who was assisted by E. D. Gardner.

The new automatic electric traffic gates have been installed on the Eureka Slough lift bridge. They will contribute greatly to the safety of the traveling public when the new pavement is opened to traffic.

Division I is much encouraged by the recent public statement of the West Coast Transit Company. The stage company is asking the State Railroad Commission for permission to reduce its passenger fares because of the lessened operating costs following improvement of the Redwood highway by the California Highway Commission.

With the exception of a short delay when the temporary bridge across the Van Duzen River was washed out during recent floods, there never has been a time when the Redwood highway was not open to traffic for at least a portion of each day. This is the record of Division I, despite 150 slides and a rainfall reaching 70 inches in some parts of the district.

RAIN AND SNOW KEEP MAINTENANCE FORCES BUSY IN DIVISION II

ALTHOUGH it can not claim a rainfall equal to that in the north coast counties, Division II has been having its troubles in recent weeks with both snow and slides. More snow removal work has been done in the division this winter than ever before. Between Mount Shasta City and Weed, drifts three feet in depth have been cleared by snow plows. Farther south, lesser drifts have been removed from the Pacific highway. Summits on the Alturas, Susanville, and Weaverville laterals have been cleared of snow.

At no time, however, has the Pacific highway been closed to traffic for more than a few hours at a time. Floods closed the road at Cottonwood and also at Corning for short periods but little damage was done to the highway at either point.

Numerous slides have occurred but the maintenance crews have managed to keep the highway open.

Widening Activities Resumed.

The Nevada Contracting Company, which has taken over, with the approval of the commission, the contract of Edwards Brothers for widening the third unit of the Sacramento canyon above Redding, is now at work and the road is closed to traffic from 6.30 p.m. to 10.30 a.m. daily. After May 15th, it will be closed but eight hours each day.

The Nevada Contracting Company and Dunn and Baker each finished their 1924 grading contract during March.

COMMISSION TAKES OVER SECTION OF COLFAX-GOLD RUN PROJECT

CONSTRUCTION of the Colfax-Gold Run section of the Nevada trunk line connection, Division III, has progressed to the point where the commission has relieved the contractor of the maintenance of 1.7 miles of the new grade. About four miles of the rough grading has been completed despite heavy rains which slowed down the work during recent months.

The Boca-Floriston grading contract, in the Truckee River canyon, is reported about 50 per cent complete with work progressing slowly due to weather conditions.

Division III has completed the placing of thirty miles of gravel and crushed rock shoulders on highways, mostly in the valley sections.

Rains in many places in the Sacramento Valley are reported the heaviest since 1915. In several places pavements were flooded and maintenance crews assisted traffic by marking the pavements with stakes, towing cars and placing warnings.

Crushed rock is being stock piled at various places along the valley roads. A single crew is doing the work instead of the various maintenance crews, as this is believed a more economical arrangement. About 125 cars of crushed rock are being stock piled by a nine-man crew.

DIVISION IV REPORTS STORM DAMAGE TO NORTH BAY HIGHWAYS $100,000

EXCESSIVE rain during February resulted in extensive damage to state highways in Division IV, particularly in Marin County. Division Engineer J. H. Skeggs estimates the cost of repairs will be $100,000. Measurements taken at San Rafael show a precipitation in a period of fourteen hours of 6.77 inches. Sections of the highway were flooded in many places in Marin County and the Corte Madera grade had to be closed temporarily for the removal of slides.

The Freeman and Whiting contract, for widening a section of the Peninsula highway in the vicinity of Menlo Park, San Mateo County, has been completed and accepted by the commission. Traffic conditions, observation shows, have been greatly improved.

Grading work on the Skyline boulevard has been suspended for some weeks due to heavy rains during February which made impossible the operation of steam shovels and trucks.

D. A. Foley, contractor on the first unit of the Bay Shore highway, has established a camp at Belle Aire Island and is now at work with steam shovels borrowing material for the embankment fill. With more settled weather, much faster progress is expected on this project. On February 19th, a delegation of members of the legislature inspected the work under way.

Improvement Through Daly City.

An improvement of the state highway through Daly City is now under way. A local improvement district has been formed to place curbs and gutters along the route of the state highway, and the commission has arranged with Eaton and Smith, the contractors, to place a strip of concrete pavement seven inches thick at all places where the present pavement does not extend to the new curb line.

In all, 5955 lineal feet of pavement, about three feet in width, is being placed. When the work is completed, the state highway will have a uniform width of 50 feet from the south city limits of San Francisco to the southerly limits of Daly City, a distance of approximately one mile.

CONVICTS MAKING RAPID PROGRESS ON HIGHWAY UP KERN RIVER

COMPLETION of the state highway up Kern River Canyon to Democrat Springs by the end of 1925, is the prediction of Division Engineer J. B. Woodson of Division VI. The project is now 50 per cent completed, including the placing of six-inch decomposed granite surfacing. The work is being done by prisoners from Folsom prison.

Division VI has had its first 1925 reconstruction contract awarded. H. H. Peterson of San Diego will place 5.3 miles of second story concrete and 1.1 miles of flush concrete shoulders on the valley trunk line in Merced County.

Fordson tractors were provided by the division during the recent highway water to assist traffic in getting through Berenda and Ash sloughs on the Pacheco Pass lateral, Madera County. As funds for bridges are not available, fords have been constructed for crossing these streams. For a time they were under several feet of water.

NEWS FROM DIVISION VII

HAVING completed the waterproofing of the Santa Margarita River bridge, the maintenance forces of Division VII are now engaged in similar work on the San Luis Rey bridge at Oceanside on the Los Angeles-San Diego coast route.

DIVISION ACTIVITIES

Maintenance crews have completed the paving of approaches to the Santa Inez Creek bridge on the Coast boulevard, north of Santa Monica, and the new structure is now open to traffic.

1925 RECONSTRUCTION PROGRAM GETTING UNDER WAY IN DIVISION X

THE Kaiser Paving Company of Oakland has been awarded the contract for widening the state highway in Division X, between Putah Creek and Woodland and between Woodland Y and Davis. Something over twelve miles of flush concrete shoulders will be placed.

Bids have been received and are pending award for the placing of 11.6 miles of new twenty-foot concrete pavement between the Stanislaus River and Turner station, in San Joaquin County. This will be the most important reconstruction project of the year in Division X.

R. N. Murdoch is making excellent progress on his grading contract between Jackson and Pine Grove on the Alpine highway, in Amador County.

Little damage was done in Division X by recent rains. An approach to a bridge in Amador County was partly washed out and traffic was held up for a time by high water just north of Stockton.

Maintenance Activities.

Two large culverts have been authorized for the Big Oak Flat road between Chinese Camp and Jacksonville.

Daylighting of a number of dangerous turns on the Sonora and Jackson laterals will be started in the near future.

Surfacing work will be done this spring on sections of the Alpine lateral between Pine Grove and Pioneer Station.

BRIDGE DEPARTMENT NEWS

THE bridge department is elated with the preliminary report of laboratory tests on concrete going into the Rincon seawall in Ventura County. After many delays, actual placing of concrete has been begun with the expectation that the work will be rushed from now on if a satisfactory water supply holds out.

The new reinforced concrete arch bridge across the Van Duzen River, Humboldt County, has been completed and opened to traffic. This magnificent structure, 734 feet long, was designed by the bridge department and built under its direction. Humboldt County cooperated the state in financing the project.

The new Sycamore Creek bridge, north of Oceanside, San Diego County, a reconstruction project, has been completed and will be opened to traffic in the near future.

The contract of Leventon and Heintze, for grading work between Denverton and Suisun, has been extended to include the construction of a small reinforced concrete bridge over Denverton Slough, forty-five feet in length.

Storm Causes Bridge Collapse.

A county-built concrete girder bridge across Willow Brook, on the Redwood highway, Sonoma County, Division IV, was extensively damaged during recent floods. The bed of the stream scoured out from under the center pier causing it to settle vertically a distance of six feet. Traffic is being detoured around the bridge at the present time.

The two small concrete bridges under construction over the central irrigation canal, in Glenn County, are scheduled for completion by the time this is in print. Otto Parlier is the contractor.

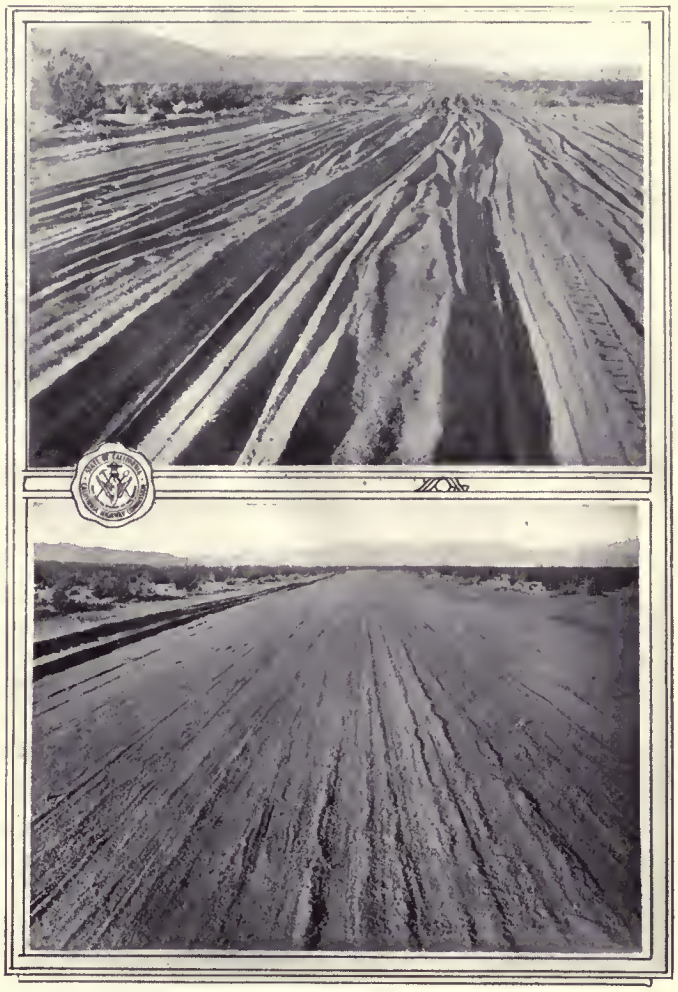
A timber bridge over Willow Creek, Glenn County, on the Willows-Oroville lateral, was washed from its supports during the recent floods. The bridge was a county-built structure and the commission and the county are considering a cooperative project for its replacement.

Very Simple.

Little Girl (to grandfather): "Grandpa, why don't you grow hair on your head?"

Grandpa: "Well, why doesn't grass grow on a busy street?"

Little Girl: "Oh, I see; it can't get up through the concrete."—Ex.



ON THE ROAD TO OWENS VALLEY—Views showing accomplishments between Mojave and Independence, Division IX. Above, the county road taken over by the commission last January for maintenance. Below, results of work by state forces. This work is provided for in the commission's 1925 maintenance budget.

BIDS ASKED ON TWO LARGE BRIDGE PROJECTS

TWO IMPORTANT reconstruction projects of the year 1925 will be the replacement of the Mossdale bridge across the San Joaquin River, in San Joaquin County, and the building of a new bridge across the San Gabriel River on the Whittier boulevard, Los Angeles County.

Bids have been received and are pending award on the San Joaquin bridge. It will be of the bascule lift span type of steel and concrete, 532 feet long. The present bridge, built by the county, has long been inadequate for traffic and has been condemned by the War Department.

The new San Gabriel bridge will take the place of a narrow and dangerous wooden structure. The new bridge will be of reinforced concrete with a clear roadway width of forty feet, and, in addition, six-foot sidewalks for pedestrians on either side.

Both projects will be financed with gasoline tax funds.

Remains of the first recorded roads are still in existence. They were built by the Assyrian Empire about 1900 B. C., and like the spokes in a wheel, radiated from Babylon to the corners of the empire.

CALIFORNIA HIGHWAYS

OFFICIAL PUBLICATION OF THE

CALIFORNIA HIGHWAY COMMISSION

SACRAMENTO, CALIFORNIA

HARVEY M. TOY, Chairman;
N. T. EDWARDS and LOUIS EVERDING, Commissioners.

ROBERT M. MORTON, State Highway Engineer.

W. F. MIXON, Secretary.

We are pleased to permit publication of any of the matter contained herein or to loan cuts and this privilege is extended newspapers and periodicals without restrictions.

FRANK B. DURKEE - - - Editor
P. O. Box 1103, Sacramento, California.

Vol. 2 MARCH, 1925 No. 3

JUST AMONG OURSELVES

☆ ☆ ☆

HIGHWAY NEWS NOTES

Maintenance Superintendent Resigns.

CARL MILLER has resigned as maintenance superintendent in Humboldt and Del Norte counties, Division I, and has accepted a position as construction superintendent with the Englehart Paving Company. He has been succeeded by W. W. Compton.

J. J. Stockard, Division I maintenance engineer, has been moved from Willits to Eureka which will be his future headquarters. Major maintenance operations necessary in the northern part of the division necessitated the change.

News From Division II.

Division II recently was favored with a visit from F. R. Seymour, formerly clerk in this division, and now Assistant Superintendent of Prison Road Camps. Come again, Fred, always glad to see you.

C. F. Woodin, chief draftsman for the past five years, has resigned to enter business in Los Angeles. Eli Dallas succeeds Mr. Woodin as chief draftsman.

E. N. Babb, chief clerk, has returned from a business trip to Oakland.

L. R. Redden, F. S. Wilson, E. L. Seitz, and J. G. Standley are among those enjoying mid-winter vacations.

Miss Josie Paul, clerk, has returned from a vacation trip to Sacramento.

Engineer Weds Auburn Girl.

H. B. LAFORGE, assistant resident engineer, Division III, has been handed a new assignment. He became assistant to Miss Marjorie Slade of Auburn, to whom he was married on February 21st. It was a double wedding, the sister of Miss Slade being wedded at the same time.

G. W. Wade, assistant maintenance engineer, recently resigned to go into business for himself. The division wishes him every success.

W. F. Remington, assistant resident engineer, has been transferred from Division III to the bridge department at headquarters.

Due to curtailment of work, H. F. Falsz, instrumentman, has been laid off.

Now He is Up in the Air.

SOONER or later they all fall. A. N. George, the aviator-engineer of Division VII, took his turn a few days ago when he was married to Josephine K. Hirsehler, of South Pasadena. The groom's best man was E. S. Gripper, a former employee of the commission.

"The church and home were profusely decorated with pale pink carnations and ferns. There were also baskets of flowers. The bride's gifts ranged from a building lot, the gift of her father, to most everything the heart could wish."

Mr. George had charge of the recent rebuilding of the highway between Oceanside and San Diego, and is now supervising the preparation of plans and specifications for the proposed reconstruction of Whittier boulevard between Montebello and Whittier.

C. P. Montgomery, resident engineer, has been assigned to the Jewett Contract, for the construction of the Coast highway through the Malibu Ranch in Los Angeles County. He recently had charge of the construction of the coast highway in Orange County between Huntington Beach and Corona Del Mar.

Snake Bite Sends Foreman to Hospital.

Maintenance Foreman V. S. Ver Bryck, of Division VIII, recently was formed to spend a week in the hospital as the result of a snake bite on the hand received while clearing away brush caught in the blade of a road grader. He suffered intense pain while being rushed to the hospital, but now seems fully recovered.

Governor Friend W. Richardson, in company with Commissioner Nelson T. Edwards and State Highway Engineer R. M. Morton, recently inspected a number of the state highways in Division VIII.

No Superstition Here.

Friday, the thirteenth day of February, brought happiness to the home of Fred R. Holm of Division X. On that date, Mary Ellen Holm arrived and daddy reports mother and daughter doing well.

Miss Lorene Gibson, typist, spent the Washington birthday holidays in the Bay cities.

H. O. Ragan and Jesse W. Cole, resident engineer and assistant resident engineer, respectively, on Contract M-44, Solano County, are leaving the employ of Division X at the end of this month.

Division X is not without its Radio fans—the last victim of Radioitis being none other than Clifford J. Temby, formerly of headquarters.

A Cure for Spring Fever.

FRED GRUMM advises all who have an over-abundance of the annual "spring fever" to join the baseball team being organized by R. A. Watkins, who looks after equipment for Division X. An outfit representing headquarters and Divisions III and X is suggested to combat a team from the shops and the laboratory.

T. E. Stanton announces that headquarters challenges any of the divisions or other state departments to either golf or tennis.

M. J. Small of the headquarters shop has been endeavoring to get some interest started in the good old Scotch game. He wants an elimination contest among the highway bunch for the selection of a team to meet other state departments and to take part in the annual city golf tournament.

New Draftsman Turns Out to be a Girl.

Charles U. Fonteneau, headquarters draftsman, passed the cigars on Tuesday, February 24th, in honor of the arrival in his home of Edith Marie, a husky daughter. Mother and child are reported doing well.

News From Woodson.

P. L. Wilcox has been appointed resident engineer in charge of the reconstruction contract in Merced County.

Philip Boulton and Leslie Tresidder have been reappointed rodmen on the Briceburg-El Portal convict project.

George L. King, Delano maintenance foreman, is breaking in a subforeman, born February 20th.

Hard Boiled.

The black-haired waitress, very much out of sorts, sailed haughtily up to the table at which sat the grouchy customer. She slammed down the cutlery, snatched a napkin from a pile and tossed it in front of him.

Then striking a furious pose—

"Whatcha want?" she snapped.

"Coupla eggs," growled the diner.

"How ya want 'em?"

"Just like you are."

A Parking Episode.

Nuf—"Yes, we had the loveliest time; Jack's car is a wonder. We passed everything on the road."

Sed—"Well, we had a lovely time, too; everything passed us."

A LOS ANGELES COUNTY FIND—Stone and bone implements and stone mortars showing remarkably fine workmanship recently were unearthed by a state highway crew on the Coast boulevard, Los Angeles County, while excavating for the approaches to the new Santa Ynez Canyon bridge. The discovery was made a few miles north of Santa Monica.

INTERESTING RELICS UNEARTHED BY MAINTENANCE CREW

STONE mortars of wonderful workmanship, knives, ceremonial wands, war clubs, arrow heads and bone fragments, probably of prehistoric Indian tribesmen, were among the things unearthed recently on the Los Angeles County coast, north of Santa Monica, by a maintenance crew of the California Highway Commission working under the direction of Foreman H. E. Garris.

The interesting discovery was made while material was being excavated for the construction of the earth approaches to the new Santa Ynez Canyon bridge. Most of the articles were found from a foot to three feet under the surface.

The stone mortars were of various sizes and shapes and were made from trap rock boulders, carefully dressed both inside and out. One of those recovered weighed over one hundred pounds. A stone dagger, several excellently formed pestles, a plate, ball sinkers, also were included in the find. Most unique of all, were five oddly carved hooks made from a very hard blue stone and evidently used in weaving.

Home of Ancient People.

Fragments of skeletons also were in the mound, apparently the bones of former residents of the region. Adjacent to the burial mound, the soil contains many fragments of shells and is nearly black. Here was the fireside of these ancient people, who presumably lived on shellfish and the grain which they ground up in their heavy mortars.

Santa Ynez Canyon undoubtedly is the site of one of numerous villages, located along the ocean front northerly from Santa Monica, in which lived an ancient race of people.

The collection of relics was turned over to the Los Angeles Historical and Art Museum at Exposition Park, Los Angeles, where it is now on exhibition.

GIBSON'S LAMENT

My FORD is my auto: I shall not want another.
It maketh me to lie down beneath it, it soureth my soul;
It leadeth me in the paths of ridicule, for its name's sake.
Yea, though I ride through the valleys; I am towed up the hills;
I fear no more evil; thy gears and thy engine sufficiently discomfort me.
I anoint thee with patches; my tank runneth over.
I prepare me for blowouts in the presence of mine enemies.
Surely if this thing follows me all the days of my life,
I shall dwell in the bug-house forever.

—Anon.

Editor's Note: The oldtimers in the department will appreciate the above which was written during the early days of state highway construction and refers to Division Engineer L. H. Gibson and his famous Ford. Gibson was then a traveling inspector. The contribution was sent in by Division Engineer T. A. Bedford, who found it in some old files at Willits.

The Radio Bug.

Oh, Ryon, poor Ryon, the radio bug,
He'll be listening in while his grave's being dug.
He monkeys with static and meters and volts,
And he twists little handles and doo-jigger bolts.
He climbs on the table and falls off the roof,
And he thinks the nonradio guy is a goof.
He'll sit up at night with his bakelit box,
'Till the cuckoos have cuckooed to death in their clocks.
He tunes in on Tampa and then he gets Maine,
And sprains his neck when he thinks he gets Spain.
His wife is a widow, his dog is forlorn,
His mind's in the ether where wave-lengths were born.
He cuts in condensers, reverses his field,
And he throws a fit when his loud-speaker squealed.
He goes to the kitchen to grab a light lunch,
Then back to his head phones to listen and munch.
I tell you its AWFUL—it goes in degrees,
But he sure does swear by that radio disease.

—L. R. Smith (with apologies to Smith-O-Grams).

You're Out.

Sam—"Don't yo' go foolin' wid me, boy. Does yo' know who Ah is?"

Rufe—"No. Who am yo'?"

Sam—Ah's de Count Ten, dass who!"—*American Legion Weekly.*

Seattle Public Library

The map above does not show all of the state highways in California but only those included in the federal aid system, representing approximately 7 per cent of the total road mileage of the state, outside of cities.

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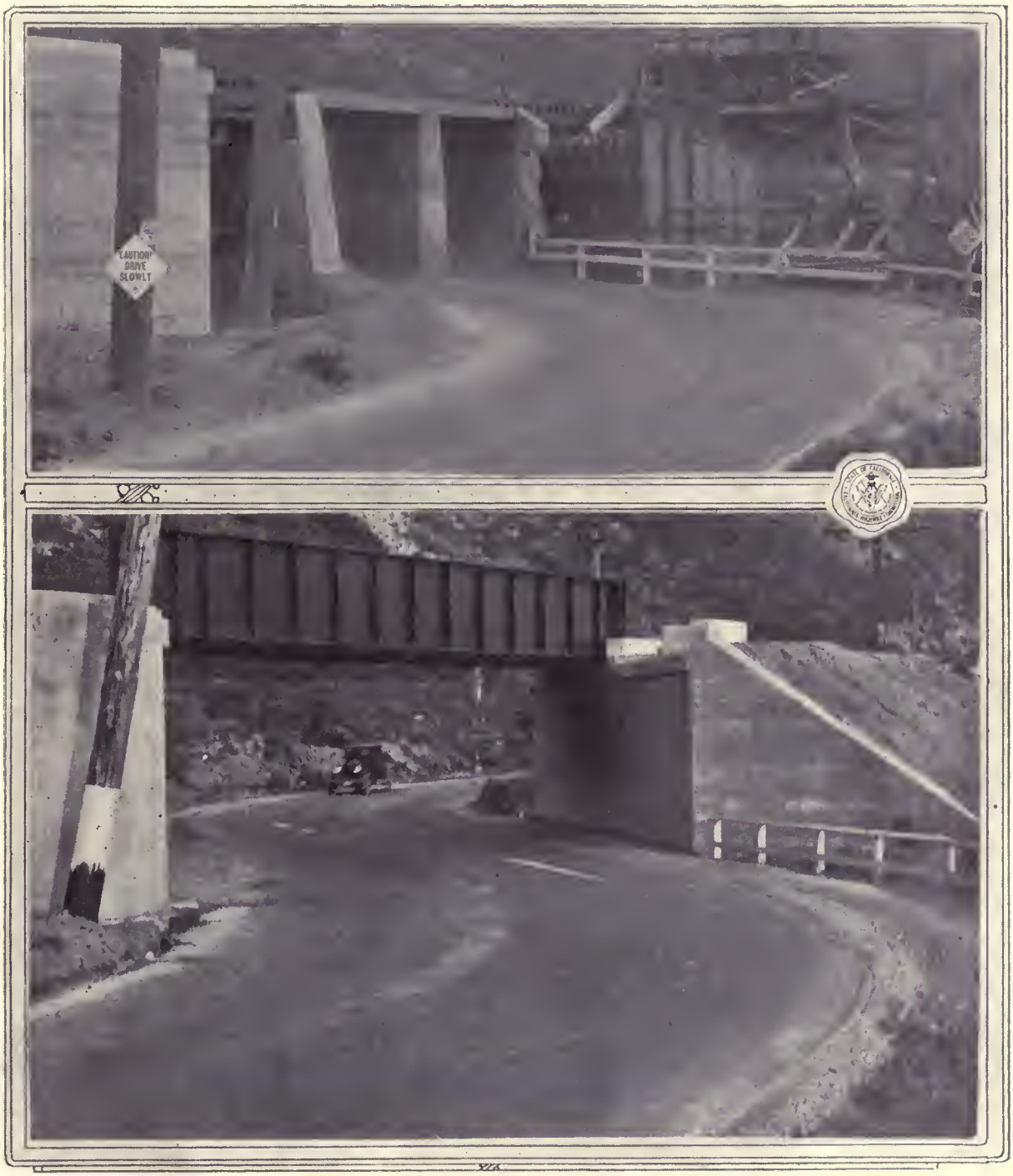

VENTURA SUBWAY, BEFORE AND AFTER—Views showing a recent improvement completed on the Coast route, north of the city of Ventura, where the highway passes under the Southern Pacific railroad. The center pier of the old subway has been removed and the underpass considerably widened to give more room and better sight distance. (Division VII.)

California Highway Department

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General Headquarters, Fifth Floor, Forum Building, Sacramento

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APRIL 1925

California Highways

VOL. 2 NO. 4

Results of Tests of Air Cleaners on Trucks in Service

By R. H. STALNAKER, Equipment Engineer.

TESTS of air cleaners on trucks in service on the Redwood highway, in Division I, preparations for which were outlined in the May, 1924, issue of the bulletin, were completed early in December and the results were presented by Professor A. H. Hoffman, of the College of Agriculture, University of California, at the recent meeting of the Society of Automotive Engineers in Detroit.

While inconclusive as to the relative value of the several types of cleaners under test, the information secured was well worth the effort, and the difficulties encountered furnished a guide for the formulating of future tests of like nature.

Eight Class B, the so-called Liberty dump trucks, to be used with a steam shovel for widening the Redwood highway, near Cummings, Mendocino County, were selected for the test. Five of these trucks were equipped with commercial air cleaners, and one with a special dust collector designed and supplied by Professor Hoffman. For the purpose of comparison, the remaining two trucks were operated without cleaners.

Motors Carefully Checked.

Both before and after the tests, the engines were torn down and measurements taken of cylinder bores, piston diameters, ring widths and gaps, and crank pin diameters, and the pistons and rings were cleaned and weighed.

During the progress of the test, the usual data of hours of operation, mileage, and gas and oil consumption were carefully kept, and in addition the crankcase oil was changed at frequent and regular intervals, and samples of the used oil forwarded to Professor Hoffman for analysis.

During the progress of the test, it was necessary to remove the cylinder heads from four of the trucks and the crankcase lower halves from five of them, in order to allow the making of necessary repairs and adjustments. For this reason, the deposits of crankcase sludge and of carbon in the combustion chambers were comparable only on the remaining trucks which had not been distributed during the test. These deposits were collected and analyzed at the end of the test. In addition to the above, the dust collected by one of the cleaners, which is so constructed as to retain all dust entrapped by it, was analyzed.

Results of Analyses.

The results of these analyses are discussed briefly:

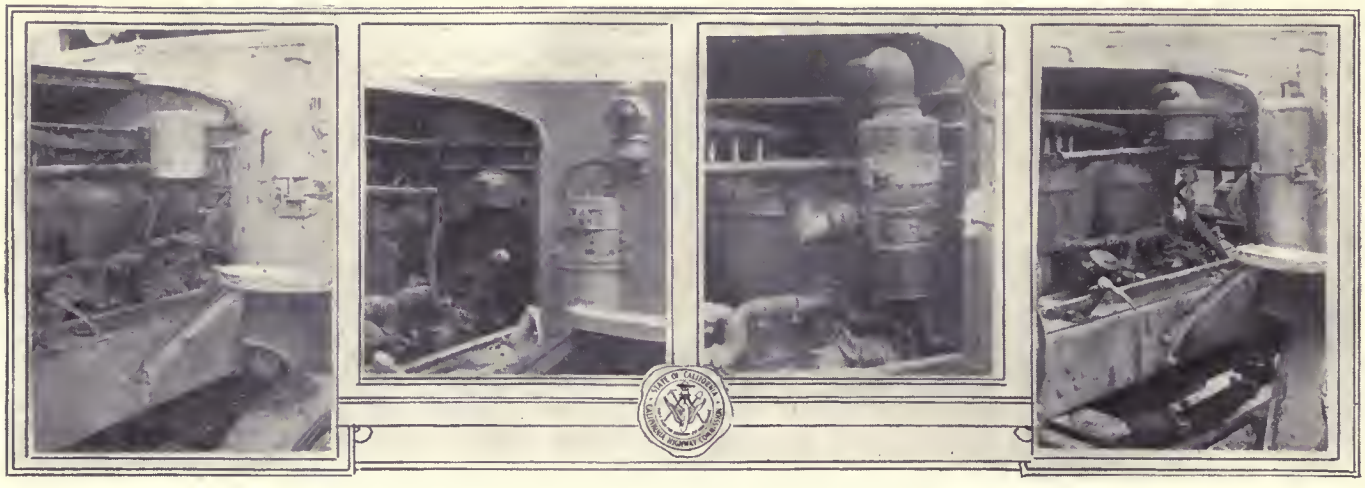
The piston and ring weights were originally taken with a Troemner-type balance, and the loss of weight in the pistons by wear was found to be within the limits of error in the original weighing. Hence these weights were discarded in the wear data. The piston ring weights were relatively more accurate. In several cases it was found that the piston diameters were larger at the conclusion of the test than at its inception. The measurements were carefully taken in both cases with micrometer calipers, which were checked against secondary standards that were apparently in as good condition as when received from the manufacturers.

Since tests by others have shown that a new cast-iron piston will increase in size when subjected to the normal temperature changes it encounters when in use in an internal combustion engine, it seems probable this increase in size was actual, and not caused by errors in either the original or final readings. For the above reasons, neither the weights nor the diameters of the pistons were used in the analysis of the results of the test.

It should be further noted that the actual wear, even on the trucks not equipped with air cleaners, was small as compared with that often found in trucks operating under no more severe dust conditions. Professor Hoffman is of the opinion that the chief reason for this is the fact that the crankcases were drained once a week for the first two months and at about ten-day intervals during the remainder of the time, thus promptly removing the accumulated dirt and maintaining the oil viscosity high, as shown by the analyses of the used oil. At any rate, the maximum increase of cylinder diameter was only .0035 inch, and the minimum .0025 inch, although the trucks were operated from 1160 to 1345 hours apiece during the test. The ring groove and piston ring wear were also comparatively small but with considerable more variation in the amount of wear.

On one of the trucks the tube connection to the air cleaner was found broken at the conclusion of the test, thus rendering the cleaner inoperative. As no information was available

STRAIGHTENING OUT THE PACHECO PASS LATERAL.—A striking example of realignment in southern Santa Clara County. The dotted line represents the old county highway in its meanderings around and over the hillsides. The new state highway is shown in the background in the upper part of the picture. The road has been considerably shortened and grades and curves improved or eliminated. (Photo by Division IV.)



Close up view of four of the commercial air cleaners tested out on state trucks operating on the Redwood highway, Division I. The Equipment Department cooperated with the College of Agriculture of the University of California in making these interesting and important experiments. Further tests of air cleaners are planned for next summer.

as to the date of the accident, all wear data relative to this truck were discarded in the final analysis.

Wear on Grooves and Piston Rings.

On the remaining five trucks equipped with air cleaners, the average increase per 1000 hours of operation in the width of the top ring groove was .0022 inch, while on the two without cleaners the corresponding quantity was .0047 inch. The average decrease in width of the top piston ring, for the trucks with air cleaners, was .0030 inch, and for the two without cleaners .0053 inch. The variation, as well as the total wear, was much more pronounced in the tip clearance of the top rings, the average increase per 1000 hours operation for the trucks with cleaners being .0293 inch, and for those without cleaners, .0941 inch. The average loss in weight per 1000 hours operation on the top rings was, for the trucks with cleaners, 2.867 grams, and for those without cleaners, 7.229 grams. The wear on the second and third rings was, on the whole, much smaller in amount, but exhibited about the same variation.

The analysis of the dust taken from one of the cleaners, as mentioned above, showed some rather interesting features. It was found that nearly 93 per cent of the dust passed a 200-mesh screen, and that less than 1 per cent was retained on a 100-mesh screen. It was further found that over 85 per cent of the dust consisted of so-called abrasives, mostly silica and silicates, and that over one-half of the abrasives was silica.

Analysis of Carbon Deposits.

The analysis of the carbon deposit removed from the piston heads, on the three trucks on which the cylinder heads were not disturbed during the test, showed carbon comprising about 80 per cent of the solids in deposit in all three cases. Abrasives averaged 1.86 per cent of the solids on two of these three trucks equipped with air cleaners, and amounted to 3.38 per cent on the truck not so equipped. Iron averaged 1.42 per cent of the solids on the trucks with air cleaners, and was 3.76 per cent on the truck not so equipped.

The analyses of the crankcase sludge taken from three trucks equipped with cleaners gave an average of 12.66 per cent of abrasives in the solids, while the sludge from the fourth truck without an air cleaner contained 20.65 per cent of abrasives in the solids.

The presence of the air cleaners seems to have had no marked effects on either the gasoline or oil consumption, the individual peculiarities of the trucks and the personal equation of the drivers apparently overbalancing any possible influence of the cleaners upon these items.

As a matter of fact, the oil-dilution percentage showed rather wide variations, ranging from 4.93 per cent to 9.22 per cent. This increased dilution may be reflected to some extent in the wear data.

Professor Hoffman's Summary.

Professor Hoffman concluded his paper with the following summation:

"Accidents must be expected in any work. That there were not more from falling rocks and trees and from caving mountainsides is remarkable. Several accidents or troubles occurred that may have had a marked influence on the wear in the engines concerned, and two cases of leaks because of warped cylinder-heads. Five out of the eight engines had the cylinder-heads off for one cause or another. One had the cylinder-blocks removed. Two exchanged crankcases so that one of them might continue in service. The shovel fell on one truck and broke its frame, decreasing very considerably its mileage total and hours of service.

"The different personalities of the twenty-five men who drove the eight trucks enter as another indeterminable factor. One truck went through the season with a single driver; another had seven. Even if the carburetor adjustments had been sealed, it seems easily possible that the driver may have been the only reason for a case of greater dilution of oil and therefore greater wear. Some of the trucks were on the morning shift, from 4.00 a.m. to noon; the remaining trucks worked from noon to 8.00 p.m. This difference possibly had little, if any, effect.

"As to the nature of the work, there was little difference. Other than hauling rock and earth from the shovels to the dumps at the edges of the fill, the work purposely was distributed among the trucks. This special work was infrequent and consisted of trips to town for cement, coal and

steel, and to the rock crusher and gravel-washing plant for the aggregates to be used in the concrete work.

Air Cleaner Test Secondary.

"Moving earth at minimum cost and in maximum amount was the very laudable objective of the engineer in responsible charge of the road-construction job. The taxpayers footing the bill would require no less of him. The air cleaner test was an interesting and worthwhile matter, but a secondary one. Hence, it would have been surprising had the test resulted in every respect as one might have hoped. No one in particular is to blame for the fact that direct comparisons of air cleaners can not be based with any fairness on the results of this test. On the contrary, the engineer in charge has undoubtedly made possible a considerable increase in the store of knowledge on the subject, and he is certainly to be commended for the fine spirit of cooperation which was apparent throughout the tests.

"The curiosity of the American traveling public is another unknown factor that can not be evaluated in this case. Any newfangled contraption arrests the attention and interest of the passerby. Possibly this may account for the fact that one cleaner had been dismantled at some time during the test and was not reassembled properly, thus causing a considerable leak of dusty air. It would seem that, to guard against such contingencies and against possible malicious interferences, the engine hoods should be padlocked securely; but, on a test that is secondary to the main objective, this clearly would be out of the question.

Essentials of a Satisfactory Air Cleaner Road Test.

(1) "The test itself must be the main object in the operation of the vehicles.

(2) "The test must be in responsible control of one person who carries out a well-considered plan designed to secure uniformity of conditions in and for all the vehicles concerned.

(3) "The tests on any air cleaner should be run at least in duplicate, preferably in triplicate.

(4) "The several drivers should exchange vehicles according to a definite plan. They should be instructed as to the general nature and objects of the tests, and particularly as to their part and its importance. Their interest and loyalty to the program are highly important.

(5) "All air cleaners and unequipped carburetors must take their air from a standard place under the hood. The inlet opening, unless it be a multiple one, must face toward the rear of the vehicle. When necessary, flexible metal tubing well taped can be used to extend from the inlet on the air cleaner to the standard inlet position.

(6) "Engine hoods must be sealed or locked against unwarranted interference.

(7) "Every vehicle and every air cleaner must be inspected daily, and a complete record kept of any troubles or accidents. Air-tightness of all cleaner and carburetor connections is of prime importance. Accidental troubles or defects must be remedied before the vehicle reenters the test.

"Since, in a number of respects, as already has been pointed out, the tests here reported did not meet these requirements, it evidently would be unjust to make direct comparisons on the basis of the wear in the several engines. For this reason, the names of the air cleaners have been withheld so far as comparisons are concerned. It was indicated by this test that:

(1) "In a service test involving several uncontrollable variables, no just comparisons can be drawn among air cleaners not differing greatly in efficiency.

(2) "Nevertheless, such a service test may yield valuable data, especially if, instead of one, several air cleaners of a kind are entered and the results averaged.

(3) "Frequent changing of crankcase oil and consequent maintenance of higher viscosity markedly reduces engine wear.

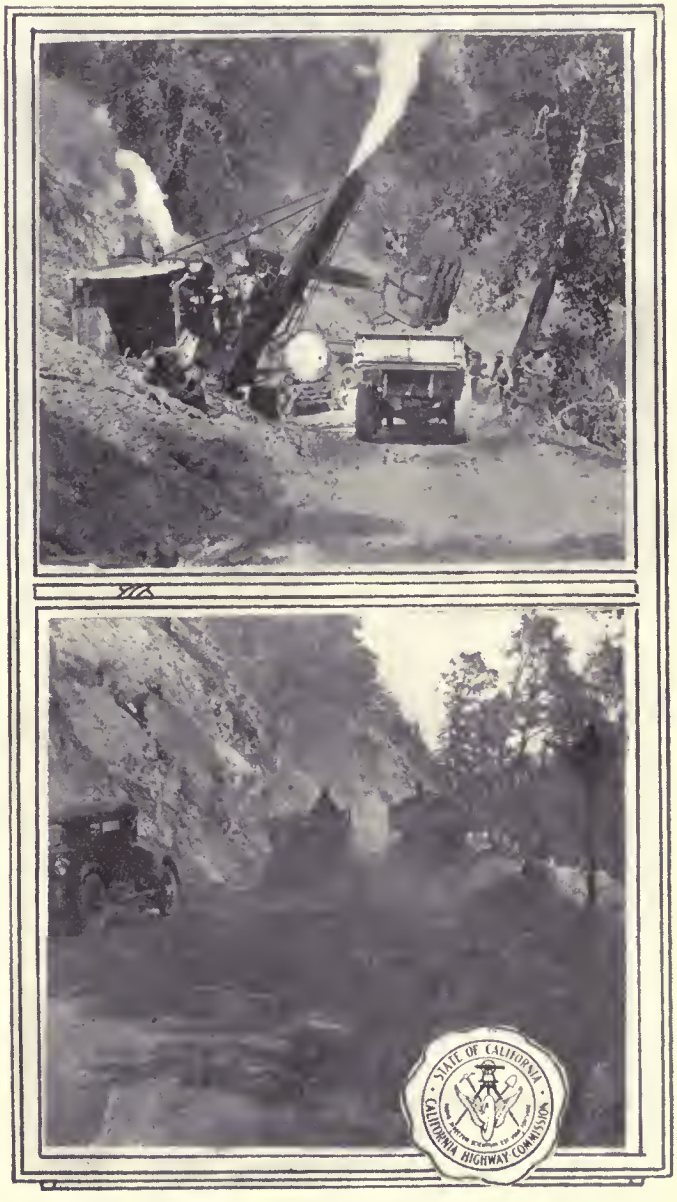
(4) "Placing the air inlet high up and well back under the hood lessens the quantity of dust encountered.

(5) "The air inlet should not face forward. A rearward opening acts as an inertia-type dust-separator.

(6) "An air cleaner is a needed and worthwhile truck-engine accessory.

(7) "For certain types of air cleaner, a short-duration laboratory test of efficiency is inconclusive, unless supplemented by one or more long-time tests."

(Continued on page 13.)



Views showing character of widening work performed on the Redwood highway by trucks on which air cleaners were placed during recent test.

NEW SANTA ANA RIVER BRIDGE LINKS BEACH CITIES IN SOUTH—Scenes at the recent dedication of the Santa Ana River bridge on the Coast boulevard, Orange County. UPPER LEFT, Commissioner N. T. Edwards with silver plated shovel just after he had removed the last barrier of earth; UPPER RIGHT, the new bridge built by the county under joint state and county inspection; LOWER LEFT, another view of the bridge showing wide roadway; LOWER RIGHT, Miss Belle Bennett, screen star, and officials of beach chambers of commerce who took part in the ceremonies.

NEW BRIDGE AND HIGHWAY LINK SOUTHERN COAST CITIES

By L. M. Ranson, Assistant Division Engineer.

ONE of the greatest events of the year for the communities along the Coast boulevard, south of Los Angeles, was the formal opening on March 21st of the new steel and concrete bridge across Santa Ana river between Huntington Beach and Newport. In the words of Commissioner Nelson T. Edwards, "It was a great day for the South Coast."

Opening of the bridge permits use of the new state highway pavement recently completed between Huntington Beach and Newport Beach, and affords a direct connection along the coast between the cities of Newport Beach, Balboa, Costa Mesa, Huntington Beach, Sunset Beach, Seal Beach, Long Beach and Los Angeles harbor. It will shorten the time of automobile travel from Newport Beach to Huntington Beach by 20 minutes, to Long Beach by 25 minutes, and to Los Angeles by 35 minutes.

The new bridge and highway were dedicated with an elaborate ceremony in which the mayors and large delegations from each of the beach communities and Los Angeles took part.

Formal presentation of the bridge on behalf of Orange County was made by Supervisor T. B. Talbert. It was accepted by Commissioner Edwards on behalf of the state. Prior to the ceremony, the commissioner was presented by the Associated Chambers of Commerce with a silver shovel which he used in removing the last of the earth covering from the bridge.

The barrier, fashioned from bands of ribbon, was broken by Miss Belle Bennet, screen star, who was present as a special guest of the Orange County Chamber of Commerce.

(Continued on page 8.)

RESULTS OF FIELD TESTS OF BRIDGE CONCRETE

By Harlan D. Miller, Bridge Engineer.

CAREFUL tests have been made during the last year and a half of the strength of concrete used in the construction of state highway bridges in various sections of California. These tests are of considerable interest because they show the strength of concrete obtained under actual working conditions, using variable aggregates and different brands of cement.

In all, about 800 samples of concrete were taken during the construction of fifty bridges. These samples were secured on the job as the concrete was poured from the mixers; precautions being taken in each case to see that the samples were typical of all of the concrete to the run, and that, in every respect, they represented average conditions. About one-half of these samples were tested at the end of ten days and the remainder after twenty-eight days of curing.

Pasteboard cartons, in the shape of cylinders six inches in diameter and twelve inches long, are used in casting samples, which are kept on the job under the same conditions as the concrete in the structures until of the desired age for breaking. They are then shipped to the state testing laboratory at Sacramento. The ultimate strength of the concrete in compression at the particular age is thus determined.

Tests Fair Representation.

In making the concrete covered by the tests completed to date, there were used seven different brands of cement and aggregates from many sections of the state and of considerable variableness; twenty resident engineers participated in the supervision of the work. Taking these factors into consideration, it may be assumed that the tests fairly represent actual field concrete as it is now being produced in California state highway bridges.

The bridge department is making a very earnest effort to secure uniformity of results in its concrete, rather than exceptionally high strength. With this in view, the resident engineers are drilled in the theory of proportioning of aggregates, careful measurement of water content, bulking of sand, etc. Aggregates are proportioned according to the Abram's theory to produce the greatest workability with the least amount of water.

The average slump of the concrete used in the fifty bridges, built during the last year and a half, was about 2¼ inches. This includes concrete for columns, beams, girders, slabs, arches, railings, posts, and piles.

On the accompanying chart is plotted the results of field tests of concrete going into seven bridges on the state highway trunk line between Sacramento and Stockton (X-Sac-4-B). This chart is typical of our bridge concrete.

Tests Show High Strength Concrete.

If the average strength of concrete produced in the bridges covered by this chart were used as a basis for the allowable unit stresses in design, as recommended by the Joint Committee on Standard Specifications, the allowable stress would be 1500 pounds per square inch. If the lowest break, namely 2800 pounds per square inch, were used, the allowable unit stress for design in compression would be 1120 pounds. This compares favorably with the allowable unit stress of 650 pounds per square inch used in the design and approved in the committee's specifications.

The bridges covered in the chart were built under the supervision of A. J. Meehan, resident engineer, with D. C. Willett, assistant bridge engineer, assisting in the proportioning of aggregates. The tests were made by the testing laboratory under the supervision of C. L. McKesson, research engineer for the Construction Department, and E. T. Maddocks, testing engineer.

The contractors on this project were T. H. and M. C. Polk of Chico.

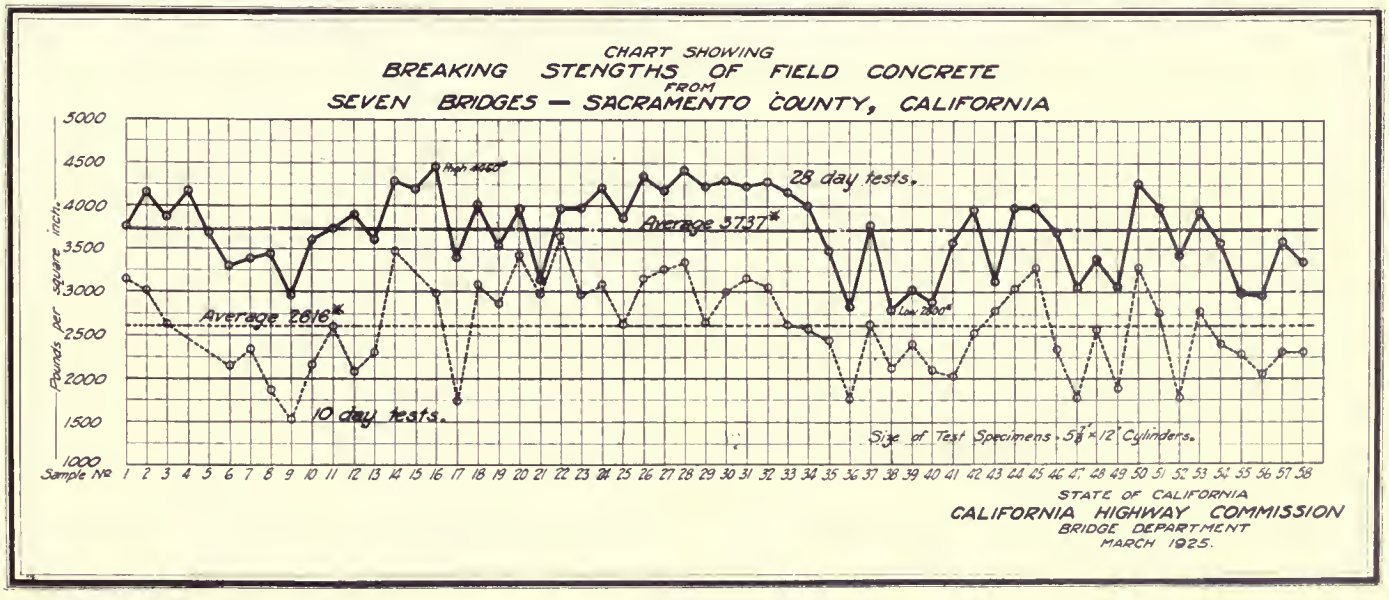
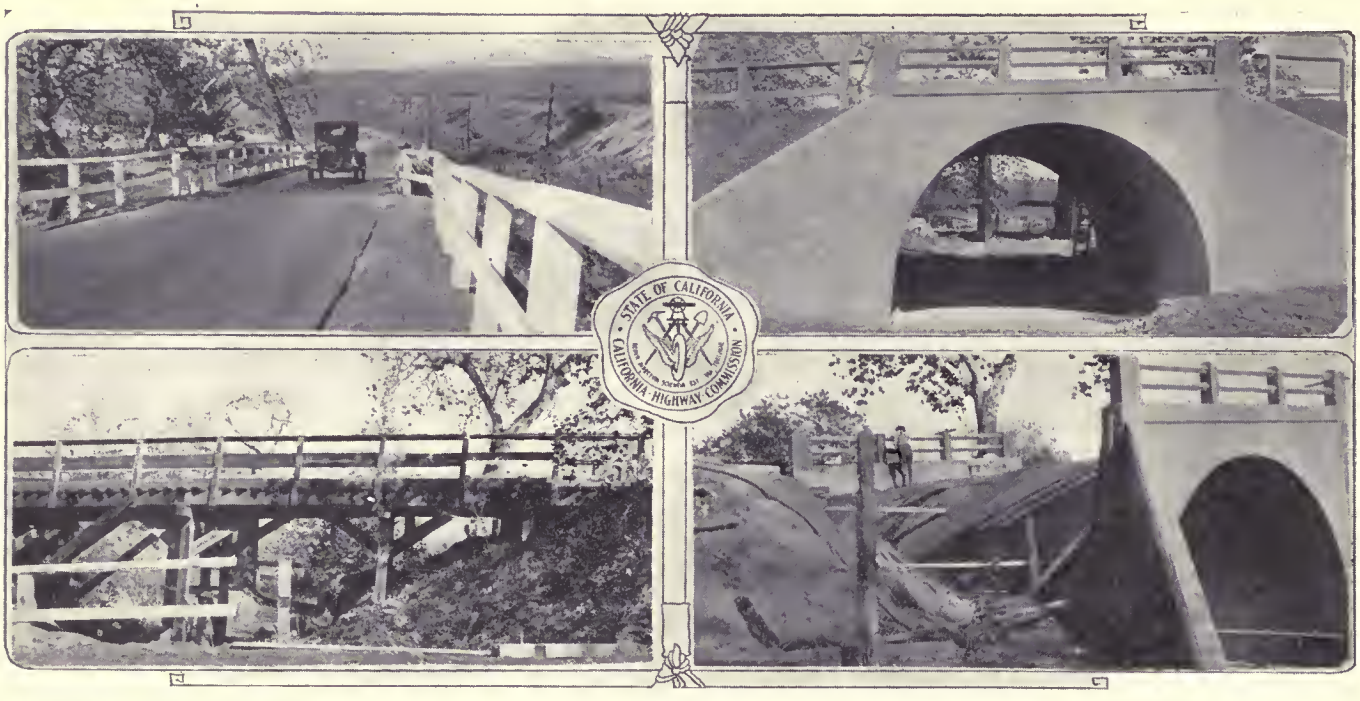


CHART SHOWING
BREAKING STENGTHS OF FIELD CONCRETE
FROM
SEVEN BRIDGES — SACRAMENTO COUNTY, CALIFORNIA
Pounds per square inch.
5000
4500
4000
3500
3000
2500
2000
1500
1000
High 4460*
28 day tests.
Average 3737*
Average 2816*
Low 2800*
10 day tests.
Size of Test Specimens, 5⅞" × 12" Cylinders.
Sample No. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58
STATE OF CALIFORNIA
CALIFORNIA HIGHWAY COMMISSION
BRIDGE DEPARTMENT
MARCH 1925.



THE OLD AND THE NEW—At left, the old Sycamore Creek bridge on the Coast highway, north of Oceanside, San Diego County. RIGHT, new concrete structure which has taken its place. Note the narrowness and light construction of the old bridge which made it a menace to traffic. Plans by bridge department of the California Highway Commission.

SMITH RIVER HIGHWAY OPEN

THE TERRORS of Gasquet mountain, impassable mud in winter and a hard, dusty pull in summer, are ended forever for the user of the Crescent City-Grants Pass highway in Del Norte County. The new water level highway from Adams Station to Patrick's Creek has been opened to travel by Division I, eliminating the narrow, winding grade over the mountain.

The new section is now being surfaced but this work is not expected to seriously interfere with its use during the summer season. The building of this unit of the state highway was financed in part with forest highway funds, and the work was done under the direction of the Bureau of Public Roads, acting for the Forest Service. Between Patrick's Creek and the Oregon line, grading is now underway but it is not expected that this section will be ready for travel during 1925.

The new highway along Smith River, a stream of unusual beauty and undiminished flow, has a grade of approximately 1 per cent. Its opening greatly improves traffic conditions on the Grants Pass interstate connection.

PLAN CELEBRATION IN SOUTH

WITH the 8.2 miles of new grading and pavement between Huntington Beach and Corona Del Mar opened to traffic and in service, the Los Angeles and Orange County coast cities are planning another big road celebration to be held at Laguna about May 15th, to mark the completion of the grading on the coast state highway, between Corona Del Mar and Laguna Beach.

Orange County is now acquiring rights of way for the continuation of construction on this route between Laguna Beach and Serra, the southern terminus of the Oxnard-San Juan Capistrano state highway, better known in southern California as the Coast boulevard.

Heavy travel for this highway is predicted, as soon as it is completed, as it will provide not only a scenic drive along the ocean front but a means of avoiding traffic congestion in the up town sections of Los Angeles.

NEW SANTA ANA RIVER BRIDGE

(Continued from page 6.)

S. V. Cortelyou, division engineer, was unable to attend owing to illness. He was represented by Assistant Division Engineers J. C. More and L. M. Ranson.

The new bridge is a combination reinforced concrete and steel structure 524 feet in length, consisting of two 21-foot and ten 35-foot spans of concrete with three middle spans of steel, each 60 feet long. The roadway width is 24 feet. The bridge was built by the McKay Engineering Company under contract with Orange County. The inspection was handled by the bridge department of the California Highway Commission, represented by Joseph Hodges as resident engineer. The cost of the structure was $63,131.

The new highway and bridge are important links in the Oxnard-San Juan Capistrano route added to the state highway by the 1919 bond issue.

Roads as we now construct them promote and develop interstate commerce.—*Senator Smith.*

The Nation must be looked on as a unit. Our policy is wise, is not to be abandoned. There is left no doubt as to what is the policy of the government as far as Federal Aid to the building of roads goes. It is a nonpartisan movement, or, rather, an omnipartisan movement, all parties favoring it.—*Senator Fess.*

Many Problems Involved in Highway Tree Planting

DURING recent months, 2643 shade and ornamental trees, furnished the commission by the state nursery at Davis, have been planted along the state highways of California. The work has been done by the maintenance forces, and represents replacements in previous plantings where trees have died during the recent dry season.

The trees received by the commission, according to the report of State Forester M. B. Pratt, are as follows:

Arizona ash 612; arborvitae 18; elms 35; eucalyptus 12; locust 885; poplars 340; sycamores 134; walnut 607. The market value of these trees the forester estimates at $1,000.

Plantings were made in the vicinity of the following communities: Redding, Fresno, Rio Vista, Gridley, Willits, Goshen, Rodeo, Petaluma, San Jose, Maxwell, San Juan Bautista, Red Bluff, Bakersfield, Sacramento, Arbuckle, Williams, Madera, Stockton, Merced, and Perkins.

Considering the lack of rainfall in many parts of the state for several seasons, the number of replacements necessary this year, 2643 out of approximately 30,000 plantings, is considered comparatively small and is indicative of the care given the trees by the maintenance men. The budget for tree maintenance for 1925 is $60,000.

Replacement is but one of many problems involved in the planting of trees along the highways. In past years, many trees have been planted by inexperienced persons and without proper supervision. Holes have not been dug to the proper depth or trees have been planted without blasting the hardpan, where such exists. In some locations it has proved exceedingly difficult to make trees live under these conditions, and the cost to the commission for watering plants and equipment has been considerable.

In other places, trees have been replaced too close to the existing pavement and will have to be removed when traffic demands widening of the roadway. To overcome these mistakes, the commission for several years has employed W. E. Glendenning, a tree expert, to supervise all plantings and to advise maintenance crews in the care of trees. The state forester assists with this work in an advisory capacity.

The commission has no funds available for extension of plantings and such as have been made have been the work of individuals and organizations interested in the beautification of the highways. The commission requires, in addition to the planting, a deposit of one dollar per tree for their care during the first year. After that they are maintained at state expense.

BIDS ASKED FOR IMPORTANT LINE CHANGE IN SOUTH

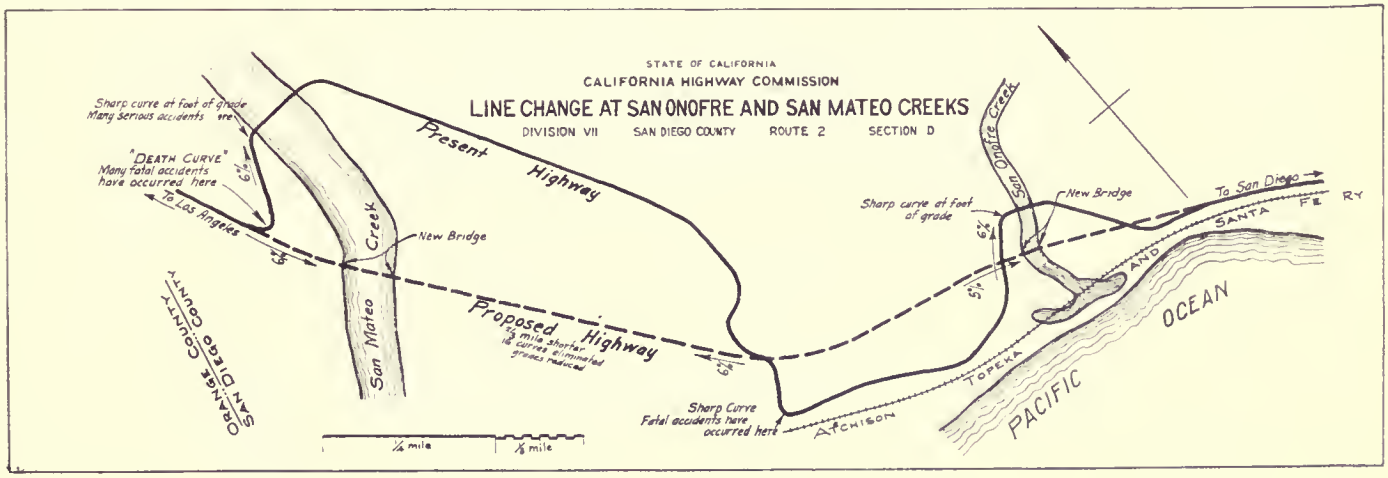
SHORTENING of the state highway two-thirds of a mile, elimination of sixteen curves and the reduction of grades are some of the results which will follow the rebuilding of the Coast state highway between San Onofre Creek and the northern boundary of San Diego County, bids for which have been asked by the commission. The most important feature of the project will be the elimination forever of sharp curves which have taken a heavy toll of human life.

In addition to the grading and paving of the highway on the improved alignment, as shown in the above map, new bridges will be built across San Onofre and San Mateo Creeks. Bids for these structures also have been asked and it is expected the work will be under way in the near future.

Original Pavement on County Grade.

When the highway was first paved along the San Diego coast it was placed on the roadbed originally graded by the county. Engineers of the commission for years have been hoping for the elimination of these death traps but until the gasoline tax became a law funds for the work were not available.

The grading and paving on the new line will be paid for out of the gasoline tax fund; the bridges will be financed with federal aid. San Diego County, however, has agreed during the next two years to refund to the state the cost of the structures.



MOTOR VEHICLE FUND CONTRACTS (Including Gasoline Tax Fund)

CONTRACTS COMPLETED SINCE JULY 16, 1924, OR UNDER WAY ON APRIL 6, 1925.

Cont. No.	Division	County	Route	Sec.	From	To	Miles	Type	Contractor	Estimated cost	Date Contract approved by Attorney General	Contract time, days
M-28*	V	San Benito	67	A	I-5 mile south of San Benito River	Pajaro River Bridge	3.04	Grading and Asphalt Macadam Surface	Granite Construction Co.	$87,184 71	Sept. 20, 1923	180
M-29*	I	Mendocino-Humboldt			Route 1			Painting 17 Bridges	Chas. L. East	11,453 48	Nov. 6, 1923	135
M-30*	III							Painting 5 Bridges	Jenkins & Elton	10,087 98	Nov. 20, 1923	90
M-31*	V	Monterey	2	I	Bridge across Salinas River at Nacimiento Station			Floor Repairs	Theo. M. Maino	22,270 75	Nov. 20, 1923	90
M-32*	II	Siskiyou	3	C	Hornbrook	Yreka	11.00	32,340' Guard Rail	Calvert & Calvert, Schroeder & Pearce	25,289 48	Dec. 1, 1923	100
M-33*	II	Siskiyou	3	C	¼ mile north Shasta River	Oregon Line	14.30	Grade and Gravel Surface	Dunn & Baker	351,360 00	Dec. 5, 1923	150
M-34*	VII	Los Angeles	4	D	Quail Lake	Northerly boundary	10.43	Grade and Widen Roadbed	Williams & Singletary	42,595 73	Jan. 17, 1924	150
M-35*	X	Sacramento	4	B	McConnell Station	Sacramento	13.03	Concrete Base	Kaiser Paving Co.	430,337 63	Jan. 17, 1924	200
M-36*	VII	San Diego	2	A & B	San Diego	Oceanside	18.7	Concrete Base	Jahn & Bressi	550,688 77	Jan. 24, 1924	250
M-37*	II	Shasta	3	B & C	Bayha	Halfway Creek	9.92	Grade and Gravel Surface	Nevada Contracting Co.	553,442 76	Jan. 21, 1924	300
M-39*	VII	Los Angeles	2	B & C	Shoup Avenue	Westerly boundary	13.06	Grade and 11.56 miles Concrete Slab and shoulders	Geo. H. Oswald	431,831 37	Feb. 4, 1924	200
M-40*	VII	Ventura	2	A & B	Southerly boundary	Camarillo	13.50	Grade and 7.4 miles Concrete Slab and Shoulders	Sam Hunter	339,279 89	April 3, 1924	200
M-41*	IV	Santa Clara	5	A	Milpitas	Coyote Creek	3.84	Waterbound Macadam Shoulders and Asphalt Concrete Surface	Federal Paving Co.	90,318 34	April 11, 1924	90
M-42*	VII	Los Angeles	2	D	Pasadena Avenue	Montebello	2.78	Concrete and Asphalt Surface	Geo. H. Oswald	189,216 71	April 29, 1924	150
M-43*	X	Sacramento	4	B	Old Elk Grove	Sacramento		Twelve Bridges	T. H. & M. C. Polk	47,062 24	May 9, 1924	100
M-44*	X	Solano	7	D	Vacaville	Batavia	8.29	Concrete and Asphalt Pavement	Foree & Currigan	250,961 51	May 27, 1924	175
M-45*	VII	Orange	2	A	Easterly boundary	San Juan Bridge	9.45	Widening Roadway	Williams & Singletary	37,424 66	June 4, 1924	150
M-46*	IV	Marin-Sonoma	8	A	Across Petaluma Creek			Painting Bridge	Jenkins & Elton	4,768 00	June 24, 1924	60
M-47*	IV	Contra Costa	14	A	Garrity Creek Bridge			Reinforced Concrete Bridge	John Phillips	4,690 75	June 17, 1924	60
M-48*	I	Lassen	29	C	Susanville	Johnstonville	4.54	Asphalt Macadam Pavement	T. H. & M. C. Polk	50,851 22	June 23, 1924	120
M-49*	IV	San Mateo	2	B	Redwood City	Southerly boundary	3.46	Shoulders and Asphalt Concrete Surface	Freeman & Whiting	132,215 77	June 23, 1924	120
M-50*	X	Sacramento-San Joaquin	4	A & D	Dry Creek Bridge			Floor Repairs and Painting	M. B. White	15,785 68	June 16, 1924	100
M-51*	II	Shasta	3	A	Olney Creek, Clear Creek and China Gulch Bridges			Painting Bridges	J. A. Mohr & Sons, Inc.	5,001 65	June 20, 1924	90
M-52*	IV	Alameda	5	A	Greenville	Livermore	4.33	Portland Cement Concrete Shoulders	W. A. Dontonville	54,528 46	June 23, 1924	75
M-53	VII	Ventura	2	F & G	Sea Cliff	Rancho El Rincon	1.20	Sea Wall	The J. H. Tilman Co.	429,865 31	June 23, 1924	500
M-54*	X	Solano	7	B	Rockville	Fairfield	3.96	Gravel and Portland Cement Concrete Shoulders	Tibbals, Percival & Cress	48,283 94	July 8, 1924	90
M-55*	V	San Benito	67	A	San Juan Creek Bridge			Reinforced Concrete Bridge	Rocca & Caletti	4,835 34	July 14, 1924	75
M-56*	X	San Joaquin	5	A	Westerly boundary	Banta	8.07	Asphalt Concrete Pavement	Valley Paving & Const. Co.	178,769 90	July 17, 1924	120
M-57	II	Shasta	3	C	Halfway Creek	Dog Creek	10.84	Grade and Gravel	Nevada Contracting Co.	454,628 25	Jan. 29, 1925	300
M-58	VII	Los Angeles	2	D	Rio Honda Br.			Sidewalk	Kurt O. Wetzel	3,722 06	Jan. 20, 1925	100
M-59	III	Glenn	45-7	A	Central Irrigation Canal			Concrete Culverts	Otto Parlier	17,195 63	Jan. 15, 1925	60
M-60	X	Amador	34	C	Jackson	Three miles East	2.62	Grading	R. N. Murdoch	18,171 86	Jan. 24, 1925	100
M-61	VIII				San Bernardino			Maintenance Shop	Houghton & Anderson	27,937 13	Feb. 24, 1925	65
M-62	III-X	Yolo	6-7	A	Southerly boundary	Woodland	12.79	Concrete Shoulders	Kaiser Paving Co.	152,904 02	Mar. 23, 1925	150
M-63	II	Shasta	3	C	Salt Creek			Bridge	Nate Lovelace	19,386 34	Mar. 27, 1925	150
M-64	VI	Merced	4	C & D	Merced River	Buhach	6.4	Concrete 2d Story	H. H. Peterson	156,844 97	Mar. 23, 1925	150
M-65	X	San Jose	4	A & B	Southerly boundary	Turner Station	11.55	Concrete Pavement and Shoulders	J. F. Knapp	290,851 88	Mar. 31, 1925	175
M-66	X	San Jose	5	B	At Mossdale			Bascule Bridge	McKay-Schruth Eng. Co.	217,857 25		300
						Subtotal	201.10			$5,759,901 42		
					PENDING AWARD—							
	VI	Fresno	4	C	Two miles north of Fresno	Herndon	5.94	Concrete Shoulders		$45,685 91		90
	III	Sacramento	3	B	W. P. Crossing			Undergrade Crossing		44,881 88		125
	III	Sacramento	3	B	S. N. Crossing			Undergrade Crossing		23,319 00		125
	I	Humboldt	1	E	Eel River Bridge			Sidewalk and Pavement		19,890 00		100
						Subtotal	5.94			$133,776 79		
						Total Motor Vehicle Fund	207.04			5,893,678 21		
						Grand total	430.28			$14,128,752 91		

NOTE—The above obligations charged against the motor vehicle and gasoline tax funds do not include funds from these sources obligated for general maintenance and for specific betterments not being done under contract.
*Completed.

STATE HIGHWAY FUND CONTRACTS (Bond Funds, Including Federal Aid)

CONTRACTS COMPLETED SINCE JULY 16, 1924, OR UNDER WAY ON APRIL 6, 1925.

Cont. No.	Division	County	Route	Sec.	From	To	Miles	Type	Contractor	Estimated cost	Date Contract approved by Attorney General	Contract time days
331*	V	S. L. Obispo-M.	56	A	6 miles north of San Simeon	Salmon Creek	12.30	Grading	Blake & Heaney	$316,825 26	Oct. 21, 1921	300
377*	I	Humboldt	1	J	Trinidad	Freshwater Lagoon	16.53	Grade and gravel	Pacific Construction Co.	604,408 60	July 12, 1922	325
395*	V	Monterey	56	E	Anderson Canyon	Sur River	13.06	Grading	George Pollock Co.	1,076,649 19	Sept. 12, 1922	400
414	VII	Ventura	60	A	Heuneme Road	Rindge Ranch	11.44	Grade and gravel	Hauser Const. Co.	880,517 82	Dec. 29, 1922	450
419*	IV	Nevada	37	C	Donner Summit	Donner Lake	3.32	Grading	Wilmshurst & Manetas	194,965 02	Jan. 19, 1923	200
427*	II	Lassen-Plumas	29	A	3 miles east of Chester	3 miles east of Westwood	12.66	Gravel Surface	T. H. & M. C. Polk	69,788 11	Oct. 13, 1923	250
431*	II	Shasta	3	B	Redding	Bayha	9.88	Concrete Base	Kaiser Paving Co.	453,708 75	Dec. 29, 1923	250
432*	III	Nevada	38	A	Truckee	Boca	7.22	Grading	Irey & Holden	118,707 68	Jan. 24, 1924	300
433*	IV	Sonoma	51	B	Beltane	Schellville	11.50	7.23 miles Grade and Gravel Surfacing—4.27 miles Concrete Base	Galbraith & Janes	325,896 99	Jan. 26, 1924	250
431*	II	Tehama	3	D	Los Molinos	Red Bluff		Six Reinforced Concrete Bridges	McKenzie & Pollard	45,976 68	Jan. 24, 1924	300
435*	VII	Orange	60	A & B	Huntington Beach	Corona Del Mar	8.20	8.20 miles Grading—3.52 miles Concrete Base	W. F. Beal	208,344 06	Jan. 30, 1924	200
436*	V	Monterey	2	F	Across San Lorenzo Creek			Reinforced Concrete Girder Bridge	Rocca & Caletti	31,636 79	Jan. 30, 1924	275
437*	IV	Santa Clara	32	B & C	Across Cedar Creek and North Fork Pacheco Creek			Reinforced Concrete Bridges	John Simpson & Co.	41,849 92	Feb. 29, 1924	150
438*	VIII	Imperial	27	B	Sand Hills	Colorado River	14.05	Grade and Gravel Surface	Kisselburg, Schmidt & Hitchcock	202,360 24	Mar. 3, 1924	200
439	IV	San Mateo	55	C	Half Moon Bay Road	La Honda Road	12.36	Grade and Gravel Surface	J. P. Holland	584,968 91	Mar. 24, 1924	175
440	I	Humboldt	1	F	Across Van Duzen River near Alton			Reinforced Concrete Bridge	Bordwell & Zimmerman	110,937 25	April 23, 1924	250
441*	II	Lassen	27	C & D	Janesville	4 miles west of Milford	9.71	Gravel Surface	Warren Construction Co.	52,663 13	May 5, 1924	200
442	III	Placer	37	C	¾ of a mile north of Colfax	Gold Run	8.03	Grading	C. R. Adams	345,096 05	June 20, 1924	450
443	I	Del Norte	1	A	Klamath River Bridge			Reinforced Concrete Bridge	F. Rolandi	440,707 50	July 8, 1924	450
444*	I	Humboldt	1	G & H	Eureka	Areata	6.45	Concrete Pavement	J. F. Knapp	273,896 44	July 17, 1924	150
445	III	Nevada	38	B	Boca	Floriston	5.32	Grading	Irey & Holden	300,869 20	July 25, 1924	300
446	III	Nevada	38	A	Across Truckee River about 1 mile north of Polaris			Reinforced Concrete Bridge	Proctor & Cleghorn	56,728 13	Aug. 8, 1924	150
447*	II				Redding			Division Office	J. P. Brennan	22,152 02	Aug. 8, 1924	90
448	IV	San Mateo	68	B	South San Francisco	Broadway Station	5.21	Grading	D. A. Foley & Co.	387,000 00	Aug. 19, 1924	300
449	VII	Orange	60	B	Corona Del Mar	Boat Canyon	5.56	Grading	W. D. McCray	150,834 37	Sept. 5, 1924	150
450	II	Lassen	29	A, C & E	Across Robbers, Baxter and Long Valley Creeks			Bridges	Lord & Bishop	21,967 88	Oct. 1, 1924	100
451*	III	Butte	47	A	2.5 miles northwest of Chico	Sacramento Ave.	1.72	A. C. Pavement	Chico Contracting Co.	39,420 17	Sept. 24, 1924	60
452	II	Lassen	28	A	Pit River			Seven Bridges and Weir	Horn, Hart & Savage	56,325 98	Sept. 24, 1924	150
453	VI	Kern	57	E	Cottonwood Creek			Bridge	J. L. Webster	32,962 50	Oct. 9, 1924	100
454*	III	Butte	3	B	Cherokee Canal			R. C. Bridge	R. B. McKenzie	15,017 46	Sept. 26, 1924	75
455	X	Solano	53	A	2 miles east of Suisun	Denverton	6.91	Grading	Leventon & Heintze	21,708 00	Oct. 19, 1924	75
456	III	Colusa	15	E	½ mile west of Freshwater Cr.	Williams	6.87	Grade and Gravel	Giddings and Whyte	72,138 92	Oct. 16, 1924	200
457*	VII	San Diego	2	C	Sycamore Creek			R. C. Bridge	H. H. Peterson	9,299 81	Oct. 30, 1924	80
458	VIII	San Ber.-Riv.	26	B-A	1-3 mile north San Ber. county line	Beaumont	7.10	Concrete Pavement	Basich Bros. Co.	212,594 96	Dec. 2, 1924	150
459	V	San Luis Obispo	33	B	Simmons Creek			Bridge	C. C. Gildersleeve	5,745 15	Dec. 2, 1924	90
460	VIII	San Bernardino	31-58	F-E	½ mile west of Barstow	1 mile east of Barstow	2.32	Grading	H. M. Henning	15,046 83	Dec. 29, 1924	60
461	VIII	Imperial	27	B	Yuma Project Main Canal			Timber Trestle	W. M. Ledbetter & Co.	7,371 00	Dec. 29, 1924	90
462	VI	Madera	4	C	Chowchilla River			R. C. Bridge	Proctor & Cleghorn	13,348 13	Dec. 29, 1924	100
463	VII	Los Angeles	60	A	Arroyo Sequit	Los Flores Canyon	16.13	Grading	S. Wright Jewett	282,098 59	Mar. 2, 1925	300
464	VIII	Riverside	26	C	San Gorgonio Wash			R. C. Bridge	De Witt & Morine	18,993 38	Mar. 23, 1925	125
465	VIII	Imperial	26	F-G	Imperial	Brawley	9.39	Grade and Gravel	H. G. Fenton	113,547 83		175
						Total	223.24			$8,235,074 70		

PENDING AWARD—None.

NOTE—Primary construction covered by the above contracts does not include funds obligated on cooperative forest highway projects or prison road camp activities.
*Completed.

WHAT THE DIVISIONS ARE DOING

LARGE RECONSTRUCTION PROJECTS IN DIVISION II COMPLETED AND ACCEPTED

TWO LARGE reconstruction projects on the Pacific highway in Division II, which have been under way since last summer, have been completed and accepted. They are the Dunn and Baker contract for widening and straightening fourteen miles of the Pacific highway immediately south of the Oregon line and the contract of the Nevada Contracting Company for similar work on ten miles between Bayha and Half Way Creek.

During 1925 it is probable only one widening contract will be under way on the main line in Division II, that of the Nevada Contracting Company for work between Halfway Creek and Dog Creek, in northern Shasta County.

Surveys Progressing.

Survey work for the straightening of the remainder of the highway through the Sacramento canyon is progressing rapidly and will be completed during the present year.

Plans are being made to treat the newly graded sections of the highway with calcium chloride. With a smooth surface on the two big contract jobs of last year and ten miles of new pavement open north of Redding, traffic conditions between Redding and the Oregon line during the coming summer should be much improved over last year.

Mountain Routes Open.

Maintenance forces have been busy removing slides and have all routes in the division open to traffic with the exception of the Susanville lateral and the Trinity lateral, west of Weaverville. The latter route is closed by the washout of a bridge over Trinity River at Cedar Flat.

Plans have been completed to erect a temporary structure at this point as soon as the spring rains have ceased and danger of further high water has passed. By the time this is in print, it is probable the Susanville lateral will have been opened to traffic.

Beautification of the grounds about the new division headquarters in Redding is now being completed. Trees and shrubbery have been set out and a lawn planted.

FINAL PLANS UNDER WAY FOR LAST LINK IN TRUCKEE CANYON

DIVISION III reports relocation of the Truckee River highway is under way between Floriston and the Nevada state line, grading of which has been included in the commission's budget for 1925. Many problems are involved because of the prior location of the Southern Pacific railroad through the canyon, power company ditches and the like. The work is in charge of W. H. Irish.

Grading operations have been resumed on the Tahoe-Ukiah highway, west of Williams, where work was suspended during the winter months. Giddings and Whyte are grading 6.9 miles which will be surfaced by Colusa County.

With the coming of spring weather grading operations between Colfax and Gold Run and between Boca and Floriston, in the Truckee canyon, are going ahead with greater rapidity. Both contracts are about half completed.

North Sacramento Fill Under Way.

Work is progressing on the building of the fill at the north end of the American River bridge, North Sacramento, the first step in the elimination of two dangerous railroad grade crossings at this point. A dredger is pumping sand from the river for the fill.

Recent flood damage on the Oroville-Willows lateral, in Glenn County, and on the Chico-Orland lateral, in Butte County, has been repaired and traffic over these routes resumed.

In Glenn County, 7½ miles of the Willows-Glenn section have been resurfaced with fine crushed rock, two inches thick and twelve feet wide.

Ditches have been dug for a mile along the Auburn-Nevada City lateral to better drainage where storm water has been affecting the oil macadam base.

The division has now completed the shaping and rocking of 45.9 miles of shoulders, largely on routes through the Sacramento Valley.

SAN JOAQUIN WORK STARTS.

H. H. PETERSON, awarded the contract for the repaving of 6.4 miles of the trunk highway in Merced County, started grading early in April and expects to begin paving operations about May 1st. Division VI is glad to get this urgently needed reconstruction work under way.

State forces are engaged in placing rock shoulders alongside the fifteen-foot pavement for a distance of 4½ miles between Goshen and Visalia, Tulare County.

GRADING OF COAST ROUTE THROUGH MALIBU RANCH WELL UNDER WAY

EXCELLENT progress is reported by Division VII on the grading of the sixteen-mile unit of the Coast highway through the Malibu Ranch north of Santa Monica, Los Angeles County. S. Wright Jewett, the contractor, recently moved in a new gasoline shovel which is now in operation.

Williams and Singletary, subcontractors on this project, have a new P and H shovel and a number of head of stock at work.

On the Hauser contract farther north along the Ventura coast, smoothing and finishing of the roadbed is now under way. Line changes are being made at Point Mugu and at Pelican Point. Additional steam shovel work is required by a recent slide in Big Sycamore Canyon.

Construction on the McCray contract, at the southern end of the Oxnard-San Juan Capistrano route, is nearing completion. A few culverts remain to be finished. This work extends from Corona Del Mar to Laguna Beach, along the Orange County coast.

NEWS FROM DIVISION X.

SURFACING of the Denverton-Suisun section of the Rio Vista lateral has been resumed with the coming of good weather. The work is being done by the county, the state having done the grading.

Reconstruction of two curves on the main line highway between Dixon and Putah Creek with the addition of standard superelevation is now under way. Repaving of these curves and resurfacing of the Putah Creek-Winters Y section soon will be completed.

Rebuilding of two bridges across the south fork of the Tuolumne River, on the Big Oak Flat road into the Yosemite, and the replacing of two small wooden bridges on the same route with metal pipe culverts is about completed. The earth backfill necessary has been secured by daylighting nearby points.

Laterals Being Improved.

Daylighting of sharp turns on the Jackson-Ione road and the Sonora lateral between Jamestown and Knights Ferry is recent maintenance work of the division.

Graveling is under way on sections of the Alpine state highway east of Pine Grove, Amador County.

Maintenance funds have been allotted for placing wheel guards on several concrete bridges in Solano County and for extending box culverts in the same county. Both are safety measures.

Funds also have been allotted for placing crushed rock shoulders on six miles of highway in Solano, Yolo, and San Joaquin counties.

Drift carried against the Sacramento River bridge at Rio Vista during the highwater of last winter disclosed a number of weak piles. Funds have been allotted to make repairs.

Raising of the wing walls at the Paradise Cut bridge between Mossdale and Banta, San Joaquin County, will be under way shortly. Wheel guards also will be placed.

BRIDGE DEPARTMENT NEWS

THE NEW Van Duzen River bridge in Humboldt County, opened to traffic last month, is receiving much favorable comment from users of the Redwood highway. Albert A. Lernhart was resident engineer on this project.

Proctor and Gleghorn have resumed construction operations on

the Polaris crossing in the Truckee River canyon, Nevada County, after a layoff of several months, due to winter weather.

Horn, Hart and Savage are again at work on the bridges being built over overflow channels of Pit River on the Alturas lateral in Big Valley, Lassen County.

The new Sycamore Creek bridge, north of Oceanside, San Diego County, has been completed and opened to traffic. This structure was built under the direction of Division Engineer S. V. Cortelyou.

Progress on Newport Bay Bridge.

Construction is progressing rapidly on the new state highway bridge over the north arm of Newport Bay, on the Coast boulevard, Orange County.

Completion of the bridge, which is a contribution of Orange County to the state highway system, will remove the necessity for using the ferryboat when crossing the bay at this point. The state is supervising construction. J. B. Hodges is resident engineer.

The new bridge on the westside state highway at the Willows city limits, Glenn County, has been completed and opened to traffic. The county cooperated with the state in financing the work. An arch with the word, "Willows," in large letters is a feature of the bridge.

THE HIGHWAY ENGINEER'S CREED

I BELIEVE that transportation is the keynote of the structure of civilization which is built of school, and church, and court, and market place, upon the twin foundations of the home and productive industry.

I believe that highway transportation is a necessary and integral part of this connecting stone in civilization's arch and is co-equal with other forms of transportation in sustaining the body of the structure.

I believe that my mission, as a highway engineer, is to assist in shaping and improving the highways of my country, in harmony with those who provide the vehicles which are their necessary complement, to the end that joined with other means of transportation, they may meet the need of our people for easy, quick and untrammelled transportation.

—*Public Roads.*

AIR CLEANERS TRIED OUT

(Continued from page 5.)

While, as stated above, these tests were inconclusive as to the relative merits of the different cleaners tested, it is believed that they have shown that some sort of an air cleaner is a very desirable adjunct to an internal-combustion engine used under severe dust conditions. The advantage is, of course, much less marked in vehicles used mostly on hard-surfaced roads, where comparatively little dust is encountered.

It appears from the results of the test that several makes of cleaners now on the market are capable of efficient dust-separation, and the problem seems to be rather one of selecting cleaners which require a minimum of attention, with due consideration of the ease of installation, cost of renewals, etc.

Additional Tests Planned.

It is planned to conduct further experiments during the coming season along these lines, without attempting any very great degree of accuracy in the measurements of actual wear, and also to make some "endurance tests" on various cleaners, by installing them on several different vehicles, and observing how long they will function satisfactorily without attention.

No small part of the burden of conducting these tests fell upon Professor Hoffman and his associates of the College of Agriculture, and credit should be given them for the results obtained.

HAYWARD CHAMBER OF COMMERCE APPROVES WIDENING WORK

THE MAINTENANCE forces of Division IV recently completed the widening of the shoulders along the state highway between Haywards and Niles, in Alameda County. The work was done with decomposed rock. That it met with the approval of citizens directly in contact with the work, is evidenced from the following letter received at the headquarters of the division:

HAYWARD CHAMBER OF COMMERCE
HAYWARD, CALIFORNIA

March 17, 1925.

JNO. H. SKEGGS, Division Engineer,
California Highway Commission,
San Francisco, Cal.

DEAR MR. SKEGGS: The Hayward Chamber of Commerce (500 members) take this means of showing our appreciation of the great work that your organization has done for the traveling public of the bay region in widening the highway from Hayward south. It is a work that is appreciated more and more each day by motorists and property owners of this entire section of the bay region.

We hope that in the near future you will be able to continue the work.

By order of the Board of Directors.

(Signed) W. W. HALEY,
President.

JACOB HARDER, JR.,
Secretary.

HIGHWAY ESSAY CONTEST.

"Economies Resulting from Highway Improvement" is the subject this year of the annual essay contest conducted under the auspices of the Highway Education Board with headquarters in Washington, D. C. May 1st is the closing date for the contest, the national winner of which will receive the Harvey S. Firestone four-year college scholarship.

A MODERN LATERAL HIGHWAY—Scene along Pacheco Creek, on the Pacheco Pass lateral. (Photo by Division IV.)

NEW REPORT FORMS FOR RESIDENT ENGINEERS ISSUED

By H. A. Waterman, Construction Department.

IN CONFORMITY with plans outlined by the State Highway Engineer, the Construction Department has prepared and distributed to the divisions a supply of new forms for the use of resident engineers in the preparation of daily reports. The new forms take the place of those that have been in use since the inception of state highway construction. The old forms required many hours of work in the preparation of reports of little practical value; this time may now be devoted to more beneficial uses.

The new forms are simply daily memorandums of the work performed by the contractor, labor and equipment days only being noted. The old laborious task of keeping a record of what the resident engineer thinks the contractor is spending on his work is abolished, but provision is made for reporting the job's progress and, except for grading work, an accurate daily record is kept of the pay quantities. From the latter, the resident engineer is able to quickly make up his progress pay estimates.

Must Obtain Schedules.

To provide a means of estimating the contractor's cost, should occasion demand, the resident engineer is required to obtain a schedule of labor and equipment rates at the inception of each job and thereafter when new equipment is put in use or rates materially changed. This schedule, with the daily memorandums, complete the file.

The new forms are convenient, pocket-size printed pads and are held, check-book fashion, in a detachable leather folder. Each major work item, or related work items, is covered by a separate form, and the assistant assigned to that particular work may readily make out his report each night when the work shuts down and hand it to the resident engineer.

On large construction jobs, this system permits the resident engineer to devote his time exclusively to overseeing the work and to solving the many construction problems constantly arising; and last but not least, makes it possible for him to have a Sunday to himself once in a while.

For the present, the oil daily and weekly reports are required on all day labor work.

VISITORS FROM NEW ZEALAND.

C. J. McKenzie and J. R. Marks, engineers of the Public Works Department of New Zealand, spent some time during the month inspecting California state highways. At headquarters, they visited the shops and laboratory and discussed construction methods with heads of departments. They were also greatly interested in the California plan for the employment of convict labor on state highway construction.

ENGINEER COMMENDS HIGHWAYS.

T. J. Wasser of Newark, New Jersey, former state highway engineer of that state, was visitor at the headquarters of the commission recently. He commended state highway maintenance in California and expressed much interest in reconstruction methods in use by the department.

MORE REDWOOD TO BE SAVED ALONG HIGHWAY IN HUMBOLDT

THE SAVING of a considerable additional acreage of very desirable redwoods bordering and near the state highway in Humboldt County seems probable as a result of the activities of the Save the Redwoods League. In a recent announcement, the league says:

> "Probably the greatest single achievement yet announced by the Save the Redwoods League is the raising of a fund in excess of $750,000, with which it is expected it will be possible to save the Dyerville Flats and a portion of Bull Creek Flat. These groves, located at Dyerville, Humboldt County, near the northern limit of the present Humboldt State Redwood Park, are among the very finest in existence. The preservation of the Bull Creek and Dyerville Flats is essential to the proper rounding out of the first unit of the Humboldt State Redwood Park.
>
> "The League has reached a satisfactory basis for negotiations with the Pacific Lumber Company, owners of these matchless tracts of redwoods, and through the mediation of Major David T. Mason, noted forestry expert, a plan is being worked out whereby these areas will be preserved for park purposes, with assurance that the owners will receive a fair price for their timber and that the plan of preservation will involve the minimum inconvenience to the company in its logging operations."

NEW EXCAVATOR TRIED OUT

THE new light type excavator, purchased in January for use in moving slides on the Redwood highway, Division I, from all reports, is proving a satisfactory piece of equipment. It was in use for 172 hours in January and handled over 3800 yards of material, or an average of about 22 yards per hour, at an average cost (including hauling and dumping the excavated material) of 47 cents per yard. However, this was exceptionally easy digging and a short haul.

During the first ten weeks the excavator was in operation—including the above quantities—it handled 7312 yards of material, at an average cost of 57 cents per yard. It has loaded as high as 267 yards in one day of eight hours.

The outfit is light and compact, weighing only 13,000 pounds. It can be loaded on a trailer for hauling from place to place without exceeding the legal load limit. It is of the Insley-Fordson make.

A second machine has been ordered by the Equipment Department for use in the south end of Division I.

NEW EQUIPMENT ON THE REDWOOD ROUTE—Insley-Fordson excavator at work near Trinidad, Division I.

CALIFORNIA HIGHWAYS

OFFICIAL PUBLICATION OF THE

CALIFORNIA HIGHWAY COMMISSION

SACRAMENTO, CALIFORNIA

HARVEY M. TOY, Chairman;
N. T. EDWARDS and LOUIS EVERDING, Commissioners.

ROBERT M. MORTON, State Highway Engineer.

W. F. MIXON, Secretary.

We are pleased to permit publication of any of the matter contained herein or to loan cuts and this privilege is extended newspapers and periodicals without restrictions.

FRANK B. DURKEE - - - Editor
P. O. Box 1103, Sacramento, California.

Vol. 2 APRIL, 1925 No. 4

HIGHWAY NEWS NOTES

To Head Survey Party.

H. K. WARD, who has been doing desk work in Division II headquarters during the winter months, will head a party in Trinity County in the near future.

E. H. Wier, for six years draftsman in Division II, has resigned and moved to southern California.

News From Division III.

J. C. North, maintenance superintendent in Division III and an employee of the commission since 1918, has resigned to accept a position with a powder company. He will be located in Reno, Nevada.

H. C. Darling, resident engineer, has been granted a year's leave of absence requested because of the illness of his father.

Miss Rose Milligan, clerk and cashier in Division III, has transferred to the children's bureau of the State Board of Control.

Division Engineer F. W. Haselwood was a speaker recently before a meeting in Placerville of the American River Home Owners' Association. He told of the plans of the commission for the improvement of the Placerville route to Lake Tahoe.

Engineers Assigned.

DIVISION VII reports C. V. Kiefer and J. P. McAndrew have been assigned as assistant resident engineers to the Jewett grading contract on the Coast boulevard through the Malibu Ranch.

Grant Resigns.

George D. Grant, superintendent of the prison road camp on Smith River, Del Norte County, has tendered his resignation, effective June 1st. Mr. Grant plans to build a wharf at Crescent City to be used as a public utility. He has been a prison camp superintendent for four years.

Joseph L. Richmond and C. F. Oliphant, assistant resident engineers, have been transferred from Division I to reconstruction work near Livingston, in Division VI.

W. K. Reed, for the past year resident engineer on the Merced River convict job, has been assigned to reconstruction work in Fresno and Kern counties.

J. W. Greely and M. H. Reed have been reappointed rodmen on the Kern River canyon project.

The principle of this legislation (Federal Aid) is the establishment of national routes, reduced transportation cost of postal service, transportation of farm products to market—products of the manufacturer to the farm.—*Senator Phipps.*

HIGHWAY ENGINEERS PROTECT TAXPAYERS

NOW AND THEN we hear someone complain about the high cost of engineers employed on our roads, says *Colorado Highways,* a state publication, and a word or two of explanation may not be amiss.

In the first place, to have good roads—and good roads means modern roads—roads that will sustain modern traffic—it requires the services of good engineers. The old system of building a road by the winding route was scrapped long ago.

Today roads are built as straight as possible and over the shortest route possible between two given points. Modern traffic demands that they be built on easy grades. To get easy grades and good alignment necessitates the employment of engineers.

Engineers are the best protection the taxpayer has in getting his money's worth in roads. Thousands of dollars are saved the traveling public in reduced travel costs on the roads now being constructed.

Not every road that is surveyed is actually built. Sometimes it is necessary to make two or three surveys to find the cheapest and best route. Surveys are necessary to eliminate costs. A prominent railroad chief engineer in his instructions to field men says that a survey intelligently made, but not used, is just as valuable to his road as one that is used.

The engineer is the agent of the people. He is on the job every minute from the time a project is started until it is finished, and sees to it that the people get their money's worth.

THE JOKE WAS ON THE GAME WARDEN

FRANK A. GREENE, deputy fish and game commissioner for the Sacramento River Canyon district, recently made a special week end stay in the neighborhood of Lamoine to nab offenders.

Getting out at the crisp hour of 5 o'clock, he was on the scene of supposed illegal operations by daylight, waiting for the evildoers. Soon, he saw a group of men hurrying along with poles and other supposed fishing equipment on their shoulders.

Greene crawled on his stomach through the brush for a hundred yards. When he had the drop on the supposed culprits, he ordered them to give themselves up. A surprised laugh greeted his command. Greene scrambled to his feet, and for the first time saw the equipment belonged to engineers of the California Highway Commission, headed by Chief of Party E. L. Seitz.

Abashed, the warden shook hands and scurried away.

New maintenance station, repair shop and warehouses recently completed at Red Bluff—This is one of the major maintenance stations of Division II. Maintenance funds build these permanent state-owned stations. (Photo by Division II.)

The map above does not show all of the state highways in California but only those included in the federal aid system, representing approximately 7 per cent of the total road mileage of the state, outside of cities.

CALIFORNIA STATE PRINTING OFFICE
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SACRAMENTO, 1925

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CALIFORNIA HIGHWAYS

A BULLETIN ISSUED BY THE CALIFORNIA HIGHWAY COMMISSION FOR THE INFORMATION OF ITS EMPLOYEES AND THE PUBLIC

Vol. 2 MAY, 1925 No. 5

HIGHWAY OF THE PADRES TODAY—View of a section of the historic El Camino Real in San Mateo County, widened to forty feet by the California Highway Commission. An additional section of the Peninsula route has been placed under contract for similar improvement which includes heavy cement concrete shoulders and a center wearing surface of asphalt concrete.

In this issue: FEDERAL CONTROL OF INTERSTATE TRAFFIC—HUMBOLDT PAVEMENT LEADS STATE FOR STRENGTH—1925 PROGRAM OUTLINED.

CALIFORNIA HIGHWAYS

HARVEY M. TOY, Chairman;
N. T. EDWARDS and LOUIS EVERDING, Commissioners.

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FRANK B. DURKEE - - - Editor
P. O. Box 1103, Sacramento, California.

Vol. 2 MAY, 1925 No. 5

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CALIFORNIA HIGHWAY COMMISSION

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HARLAN D. MILLER, Bridge Engineer
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J. H. SKEGGS, Division IV, San Francisco
L. H. GIBSON, Division V, San Luis Obispo
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E. Q. SULLIVAN (Acting), Division VIII, San Bernardino
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J. C. McLEOD, Division X, Sacramento

General Headquarters, Fifth Floor, Forum Building, Sacramento

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CALIFORNIANS TO REPORT FOR INTERNATIONAL ROAD CONGRESS

THREE MEMBERS of the staff of the California Highway Commission have been honored in the selection of American engineers to report for the Fifth International Road Congress which will be held in Milan, Italy, during September, 1926.

Mr. R. M. Morton, state highway engineer, has been chosen as collaborator on the first question—a report on concrete roads, covering the progress and achievement in the use of materials for the construction of this type of highway.

Mr. C. S. Pope, construction engineer, has been appointed chief reporter for the United States on question two—"Bituminous and Asphalt Roads, the Qualities Required and the Material Used." Mr. Pope will coordinate the reports of eight collaborating engineers throughout the United States.

Mr. C. L. McKesson, research engineer, has been chosen collaborator on the question, "Quality Required in Bituminous Binders." He is to work with A. T. Goldbeck of the United States Bureau of Public Roads.

What the Congress Is.

The International Road Congress was organized in 1908. It holds sessions every three years to which are invited the engineers of every country. Prior to the war, American engineers took an active part, and special efforts are being made to make the Milan session next year representative of the best engineering thought of all civilized nations.

The congress is governed by an international committee sitting in Paris. At the meetings, papers are presented and discussions entered into by the international reporters on the various questions proposed by the congress.

Each reporter has as collaborators, a number of engineers who have achieved distinction in the phases of the work upon which they are to report. The chief reporter assembles the papers and makes his comments thereon and submits his conclusions from his own knowledge of the subject. The congress is thus assisting to gather together the most advanced information available on the subject of road building.

MAY 1925

California Highways

VOL. 2 NO. 5

Federal Control of Interstate Highway Traffic

COMMENT ON THE RECENT DECISION OF THE UNITED STATES SUPREME COURT.

BY THE EDITOR.

THE POWER to regulate interstate commerce, delegated to congress by the constitution, the courts have decided, extends to the control of interstate motor vehicle traffic.

Improvement of interstate highways made it inevitable that this question should come before the United States Supreme Court for adjudication, and on March 2d two decisions were handed down affirming the authority of the federal government. Students of the highway problem realize the far reaching importance of these rulings and predict the situation created by the decisions will be a live issue before the next congress. *It may have an important bearing on the future of federal aid.*

In one decision from the state of Washington, the court held the state could not refuse to authorize licenses for motor busses over that section of the Pacific Highway lying within its borders. The court stated that states must not impose unreasonable burdens upon interstate motor vehicular traffic.

The other decision was in a case from Maryland. The court decided that the state could not decline to permit motor vehicles to use its highways. The state has authority to make regulations, primarily to promote safety and conservation in their use, but could not impose even an indirect burden upon interstate commerce.

States Can Not Interfere.

No state, either by statute or by regulation through a public service commission, can interfere with interstate traffic on the highways and in no way can the state invade the federal control over interstate commerce.

The decision of the federal court has been followed by the California Supreme Court which has ruled that the State Railroad Commission has no authority to impose regulations on automobile stages engaged in interstate passenger transportation. The decision reverses the superior court of San Francisco and the District Court of Appeal.

The California Case.

The reversal of the lower courts was made upon appeal of Melville Yahne, who conducts an automobile stage line from San Francisco to Portland, Oregon. Yahne was convicted in the superior court on the charge of conducting a stage line without a permit from the Railroad Commission, in violation of the Auto Stage and Truck Transportation Act.

In reaching its decision, the Supreme Court said:

> "A statute that is not concerned with the manner of use of the highways, but by whom used, is in effect regulation of commerce by the state and an unconstitutional invasion by the state of a field reserved by the commerce clause for federal regulation."

The new situation has many interesting angles. Bus interests in all parts of the country are speculating upon the outcome. It is apparent, however, from a study of the decisions in the recent cases, and other decisions of the Supreme Court upon the question of interstate commerce, that the states still retain the right to regulate *intrastate* business of bus lines even though the stages may be engaged in interstate commerce.

To Ask State Control.

Announcement has been made by the National Association of Railroad and Utility Commissions that it will ask congress at its next session to empower state commissions to regulate interstate bus lines. It is asserted the Interstate Commerce Commission does not wish to undertake the task laid out for it by the decision of the Nation's highest tribunal. No federal agency has ever been specifically authorized to undertake the regulation of vehicle traffic on interstate highways and the state commissions seem anxious to retain authority in the matter.

Just how congress can delegate to the states power which the constitution plainly confers upon the federal authority is not explained, but precedents for such action are declared to exist.

The Decision and Federal Aid.

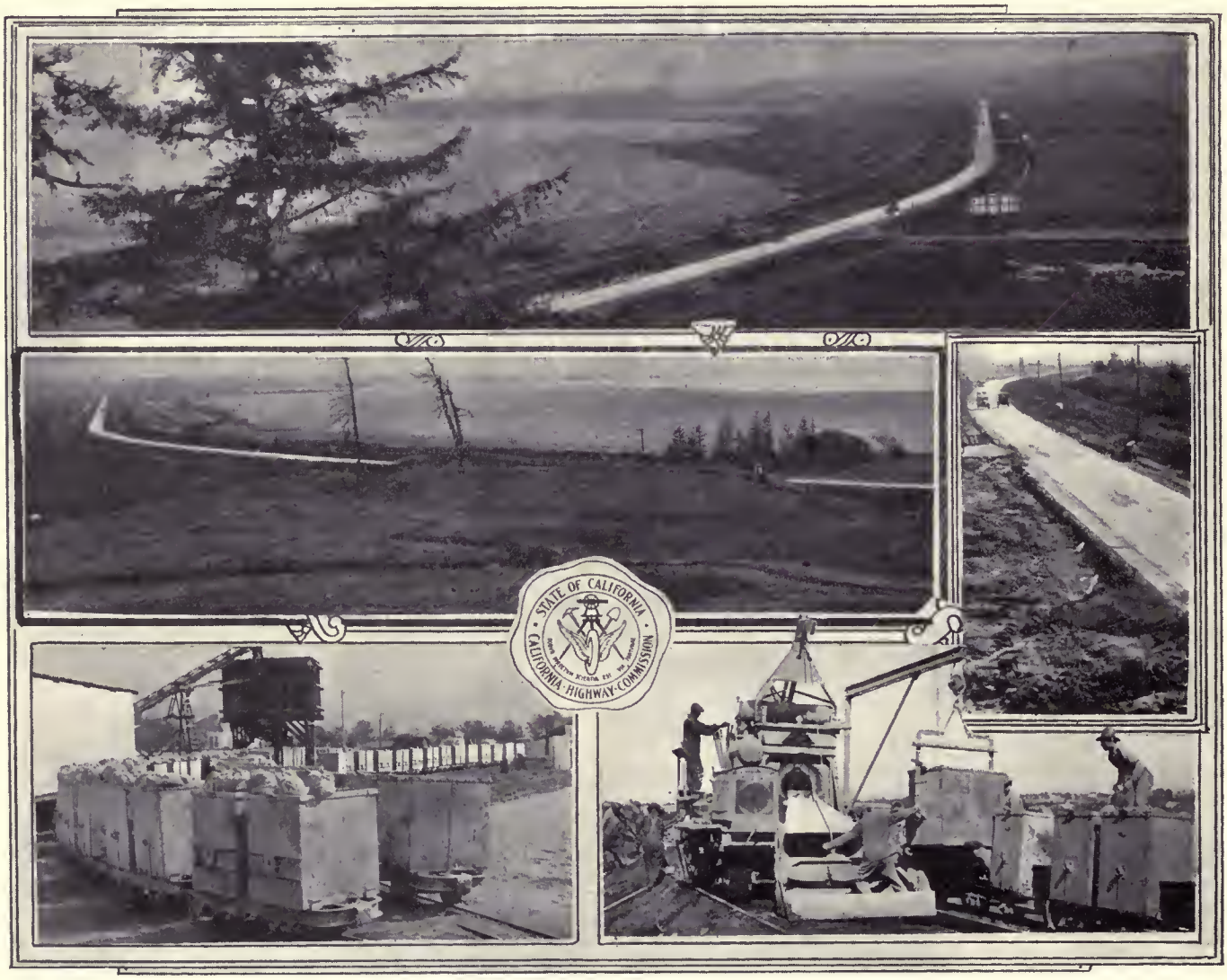
The decision of the Supreme Court is of particular interest at this time when certain eastern senators are endeavoring to wreck the federal aid plan under which a great national highway system is beginning to take form.

Western highway builders realize that the friends of federal aid must be marshalled in the not distant future for a determined stand in its behalf. To them, the decision will be not unwelcome.

FEDERAL CONTROL OVER INTERSTATE HIGHWAYS NATURALLY WILL CARRY WITH IT FEDERAL RESPONSIBILITY IN THE CONSTRUCTION OF THOSE HIGHWAYS.

The West will not forget this point.

NEW STATE HIGHWAY NOW CONNECTS EUREKA AND ARCATA



NEW SECTION OF THE REDWOOD HIGHWAY—A twenty-foot concrete pavement now spans the tide flats of Humboldt Bay, adding a unique unit to the famous highway up the north coast. *Above,* looking northward toward Arcata; *center,* view in the opposite direction with Eureka in the distance; *right,* a close up of the new road before grading of shoulders was completed; *below,* industrial railroad used to convey aggregates to mixer. This method was required by the specifications which barred trucking in order to protect the subgrade.

HUMBOLDT BAY PAVEMENT LEADS STATE FOR STRENGTH

By H. C. Ingle, Resident Engineer.

DESPITE adverse conditions under which the work was carried forward during much of the construction period, the new pavement on the Redwood highway between Eureka and Arcata, Humboldt County, ranks well with other similar state highway projects recently completed.

Laboratory tests indicate the compressive strength of concrete on the Eureka-Arcata contract is the highest of any pavement of this type on the state highway system. Twenty-eight day tests resulted in a maximum break of 6930 pounds and a minimum of 3160 pounds, or an average for sixty-four tests of 4980 pounds.

What the Tests Show.

Following is a tabulation of the breaking strength obtained from test cylinders taken on this contract:

10-day breaks—

Maximum, 4720 pounds per square inch.
Minimum, 2340 pounds per square inch.
Average (54 tests), 3391 pounds.

28-day breaks—

Maximum, 6930 pounds per square inch.
Minimum, 3160 pounds per square inch.
Average (64 tests), 4980 pounds.

A vialog record made early in May resulted in an average of 11.7 units of roughness per mile, which makes this seven-mile section the third smoothest piece of state highway pavement in California.

Clean aggregate, high quality cement and the cooperation of the field inspection force and the contractor's organization made possible the production of a uniformly high test concrete and a good riding pavement. Special efforts were made to keep the water content low and this, no doubt, should be taken into consideration in judging final results.

Interesting Section.

The Eureka-Arcata unit always will be an interesting section of the Redwood highway. Located on an almost direct line across the tide flats of Humboldt Bay, it is in marked contrast to the heavily wooded country north and south. The grade was built in 1918 and 1919 with adjacent heavy marsh material excavated by dipper dredges. As the fill settled a good surface was built up with rock and gravel. In the placing of the pavement every effort was made to utilize this macadam surfacing to the fullest possible extent for subgrade purposes.

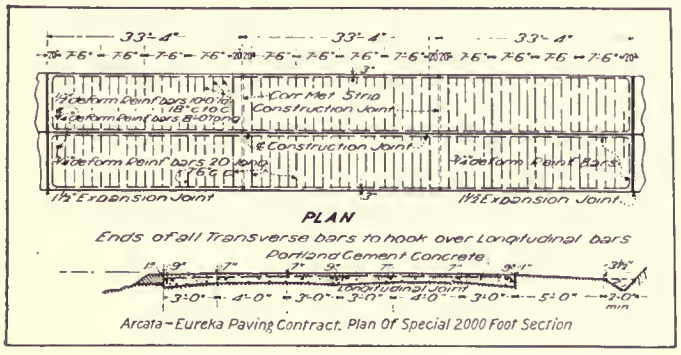
Alignment was closely adjusted so that the full area of existing gravel surface was utilized as a foundation for the pavement. In order to fully preserve the foundation strength no deep scarifying was permitted, the grade line having been laid in such manner that slight cuts only were made in the worst irregularities. Such high points were planed off and fine sand material from Brainard's Point distributed as a sand cushion to bring the subgrade to full section.

As a further protection to the macadam, the specifications required that all concrete materials be hauled by industrial railway. As there was no existing shoulder, this made it necessary that one-half width of pavement be laid at a time, and hauling done on the other half width.

Pavement Section.

The pavement section is of twenty-foot width, being laid in two ten-foot widths. The middle four-foot slab of the half section is six and one-half inches thick and thickens to nine inches at the outside edges of each half section. Prepared expansion joints 1½ inches thick were placed every 100 feet at the even stationing and corrugated metal contraction joints at 33 1/3 feet from expansions. A ¾-inch marginal reinforcing bar was placed 3 inches in from the edge and 2 inches down from the surface around each 100-foot length of half pavement section.

A portion of the roadbed, 2000 feet in length, showed evidence of possible continued settlement and a special section of pavement was laid over this. The slab thickness was increased to seven


PLAN
Ends of all Transverse bars to hook over Longitudinal bars
Portland Cement Concrete
Longitudinal Joint
Arcata-Eureka Paving Contract. Plan Of Special 2000 Foot Section

inches. In addition to the standard reinforcing steel, ½-inch and ¾-inch transverse steel was placed (as shown in diagram). The twenty-foot lengths of ¾-inch steel act as tie rods between the two half sections.

Field Laboratory Control.

Gravel and sand were obtained from Mad River. Materials were handled through loading bunkers, located at the Arcata end of the job where paving operations started on September 25, 1924. A small field office 8 feet by 14 feet was built at the loading bunkers and equipped with the necessary screens, scales, and other equipment necessary for field sampling of aggregate.

Before paving operations started analyses of aggregate were made and a trial mix determined upon. It was found that the river sand did not contain sufficient fines to be within the required grading. To overcome this it was decided to obtain sand from the ocean beach and add about ten per cent in volume of it to the river sand. This brought up the grading between the 20 and 80-mesh and produced a sand mix approaching the proper grading line.

First runs proved the theoretical mix close to a correct working mix. The effort throughout the paving was to obtain as coarse a mix as could be properly worked and finished.

Calcium Chloride Tests.

Two series of test blocks for comparative water and calcium chloride curing were made under the supervision of Mr. C. L. McKesson, research engineer from headquarters. Results from these tests were published in an article by Mr. McKesson in the February, 1925, issue of the bulletin.

Details of Pavement Construction.

A five-sack batch was used throughout the job. Mixing was done by a Multi-Foote Mixer No. 21-E, which was charged from batch boxes hauled on the industrial railway. A Lakewood mechanical tamper was employed.

Header boards were 3-inch by 10-inch, surfaced four sides and were rested on wedge stakes 2 inches square and 10 inches long driven to grade and lined at four-foot intervals. This formed a very solid support true to line and grade.

In order to hasten the completion of the work and take advantage of all favorable weather, two shifts were employed. A comparison of the finished pavement done by day and night shift shows no apparent difference and speaks well for finishers who worked by the artificial lights.

Unfavorable Weather.

Unusually early rains came in October and were a source of interruption to the work throughout the job. Over one-third of the working days for pavement work were lost on this account, but the contractor held his working crew together and took advantage of every available hour of favorable weather.

Despite these difficulties the pavement was completed on March 5th. It was thrown open to traffic March 31st.

J. F. Knapp of Turlock was the contractor. The cost of the work, including the special heavy slab, bridge approaches, paving of slopes, and hauling in of additional shoulder material was approximately $275,000, or $39,000 per mile.

New twenty-foot concrete pavement in Sacramento County placed on an oil macadam sub-base. A gasoline tax job.

NEW MOSSDALE BRIDGE AND LINE CHANGE—SAN JOAQUIN COUNTY

MOSSDALE FROM THE AIR—A contract has been awarded for the new bridge at the location indicated in the airplane view secured through the cooperation of the United State Air Service. Rights of way also have been deeded the state by the county for the realignment of the highway, substituting two easy curves for six almost at right angles.

NEW CONSTRUCTION MANUAL OUTLINES DUTIES OF FIELD MEN

SUPERSEDING innumerable General Instructions and several hundred circular letters addressed to the divisions at various times since the organization of the state highway department in 1912, the Headquarters Construction Department has issued in printed form a Manual of Instructions, which is now in the hands of the field men and effective as of May 1st.

It is the purpose of the manual to cover all matters pertaining to the work of the Construction Department. It outlines, in a single compendium, the standards and practices of the California Highway Commission relating to construction procedure, and is a part of the plan of State Highway Engineer R. M. Morton to revise and codify the many instructions and regulations, now in force, governing the work of the several departments.

Policies Set Forth.

The general policies of the department in its relation to other departments, the contractor, and the general public are set forth in the introductory paragraphs and will be of interest to engineers and the public alike. The instructions, the manual points out, are to be studied in all cases in connection with the requirements of the specifications.

Continuing, the general instructions read, in part, as follows:

"Construction employees are constantly required to exercise their judgment on minor points not covered in the instructions. Matters of major importance not covered should be brought to the attention of the Division Engineer and the Construction Department at Headquarters. * * * *Thoroughness, attention to details and integrity of purpose are just as necessary as skill and experience in dealing with construction matters.*

Relations Should be Friendly.

Relations with contractors and other employees must be agreeably maintained. Surliness or overbearing tendency on the part of construction employees will not be tolerated. The contractor risks his fortune and reputation on the job, and it might be personally profitable sometimes to imagine yourself in his position. Anticipate the contractor's difficulties. Advise, but do not try to force him to a certain course of procedure where the contract and specifications permit more than one method. Avoid taking an arbitrary stand on details prior to friendly conference with the contractor or his representative.

All employees, and particularly engineers on construction, should keep always in mind that *they represent the State of California,* and are held by the state and by the people of the vicinity to the responsibility of seeing that the work is completed so as to afford the greatest benefit and the least inconvenience to the public.

Your relations with the public should be courteous but businesslike, always governed by common sense.

Criticism of Plans Invited.

Closest cooperation is desired by the Construction Department with those representing this branch of activity among the division employees. This department is responsible for the planning of details of the work, and the division or resident engineer should not hesitate in submitting to the Construction Department criticism of any deficiency or over-design.

Organization for Construction.

With the exception of those activities under the jurisdiction of the Bridge Department, all construction operations, including preparation of specifications and modifications from standard practice which may be necessary, and also methods of control of work, are under the general supervision of the Headquarters Construction Department. This department, including laboratory and research work, is in charge of the construction engineer and his assistants.

The relationship of the department to the divisions is intended to be advisory rather than directly supervisory in nature, although, should occasion arise, the Construction Department will issue direct orders to the division engineer.

All construction work, except that relating to bridges, is directly under the supervision of the division engineer and his construction assistants. All contract jobs will be organized with a resident or assistant resident engineer in charge, representing the state, to see that specifications are carried out and the work properly performed.

Responsibility for supervising any work shall not be placed in the hands of any employee who has not had thorough experience in that particular line of work. This requirement will not be modified without the specific approval of the Construction Department.

The resident engineer will so organize his work as to require a minimum of assistance. On large construction jobs, where various branches of activities are being simultaneously carried on by the contractor, several assistant resident engineers may be required and it shall be the duty of the division engineer to see that the various jobs are properly but not over manned.

Acting under the direction of the division engineer and his assistants, the resident engineer shall have immediate charge of construction work. * * * He shall be a practical field man of experience in the particular kind of work under his direction, and shall be responsible for the satisfactory management of the state's interest. Upon him devolves the responsibility of maintaining cordial working relations with the contractor, and of upholding the good reputation of the California Highway Commission. He is responsible for the activities and efficiency of those assigned to assist him and shall see that * * * they protect the state by thorough inspection.

Assistant resident engineers will be assigned as required to help the resident engineer, and to such assistants will be delegated the responsibility of inspection of portions of the work. Upon their efficiency will depend their advancement within the organization.

The resident engineer shall keep a daily diary to be retained as a part of the division records, showing the progress of the work, salient developments, important understandings with the contractor or his representative, record of important conversations or verbal discussions and all other data which might have bearing in the future should details come into dispute.

Written Orders to the Contractor.

If an order is given which modifies in the slightest degree the meaning of the specifications, or if the contractor claims such modification, said order should be presented in writing to the contractor. Copies shall be kept of all written notices given the contractor. In case claims for extra work necessitate appearance of the resident engineer as a witness, he should not be in the position of having his unsupported word contradicted by the contractor.

Laboratory Controls Local Materials.

In the design of work, every reasonable effort will be made to effect economy by the use of local materials. *Responsibility for the acceptance of material rests with the laboratory,* and in all cases their decision as to suitability must be obtained and shall be final.

The laboratory is always ready and willing to assist the resident engineers so far as possible in solving the many problems constantly arising that are not related to the specifications. When in doubt, submit samples to the laboratory and be sure the latter is fully advised as to all the conditions involved.

All employment under the jurisdiction of the Construction Department, division engineers and resident engineers, is subject to the provisions of the Civil Service Act, * * * and the rules and regulations of the Civil Service Commission * * *. Employment of aliens directly on work performed by the state is contrary to law."

Day Labor Work.

When authority is given for doing work by day labor, such work, the instructions state, shall be performed under approved specifications as if it were a contract. The same applies to work done by prison labor. This is in accordance with the state law on this subject, enacted in 1923.

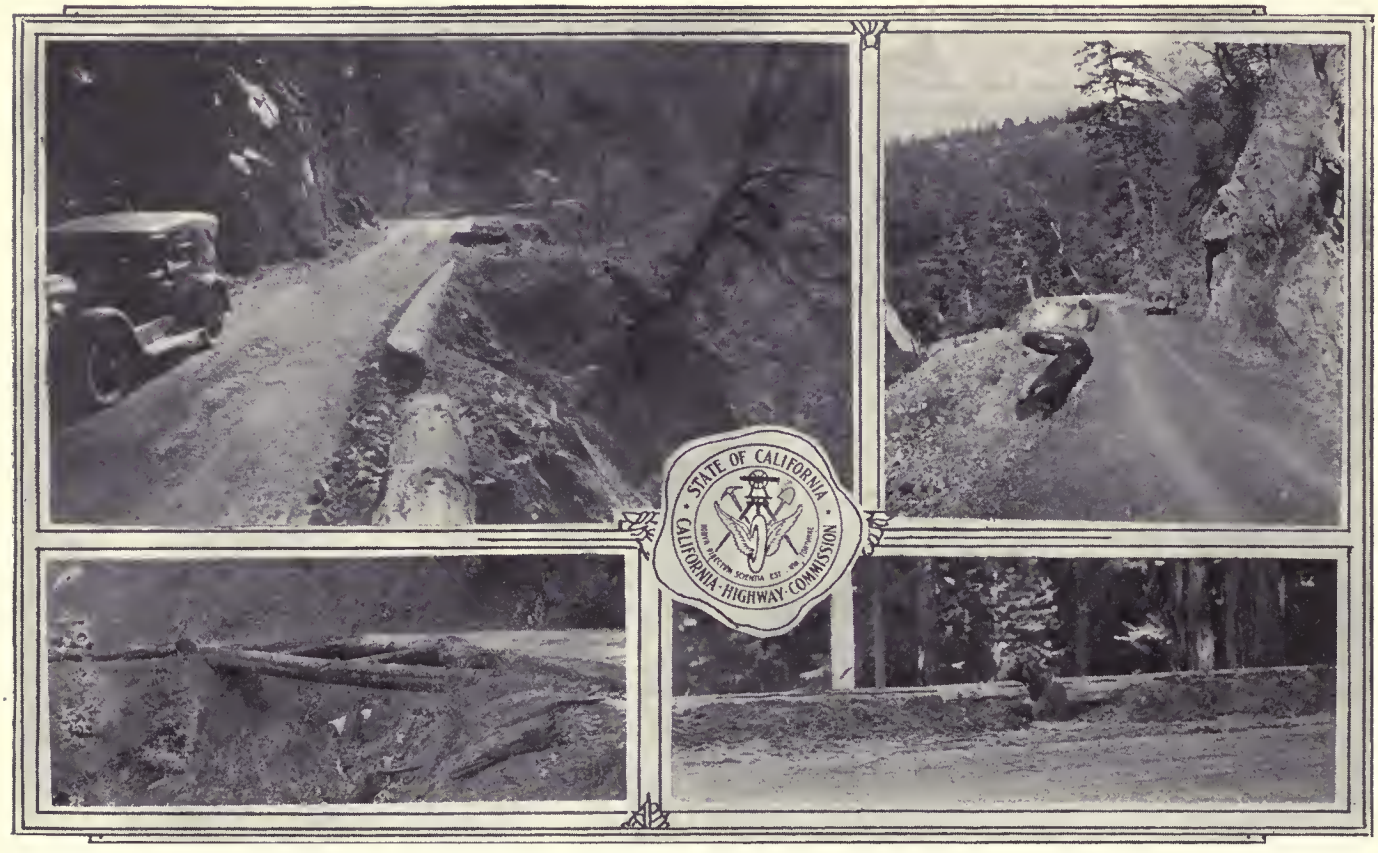
Maintenance of Detours.

Public traffic must be maintained during the progress of state highway construction. Suitable detours shall be selected, maintained and properly signed. Laxity on the part of the resident engineer in attention to this detail discredits the entire highway organization. Warning signs * * * shall be procured by the resident engineer from the division office, and placed, lighted, and maintained in good condition by the contractor.

Attention of the field men also is called to the fact that all state-owned camps must conform to the requirements of the Commission of Immigration and Housing.

In closing the letter of transmittal, Construction Engineer C. S. Pope invites "suggestions and criticisms tending to the improvement of the instructions and the economy of the work."

MAINTENANCE ON THE SKYLINE BOULEVARD—Fordson and drag at work on the Skyline Boulevard, San Mateo County. Constant dragging keeps the road smooth.



GUARD RAILS ON THE REDWOOD HIGHWAY—Views showing use of logs to warn motorists of hazardous places and increase safety of the highway. This type of traffic guard rail is b oth inexpensive and effective. (Division I.)

LOGS PROVIDE CHEAP GUARD RAIL AND DRAINAGE CONTROL

By Ira G. Thomas, Assistant Division Engineer.

UTILIZATION of local materials is not always for surfacing or paving. Along the Redwood highway, in Division I, logs that have fallen during storms or which were cut during the construction period have been used as guard rails to protect the traveling public at curves and narrow places in the roadway. They also assist in controlling drainage at the edges of high fills which are often on grades of four to seven per cent.

As its name implies, the Redwood highway in Mendocino, Humboldt and Del Norte counties is located through many miles of densely wooded country and a region of heavy rainfall. In northern Mendocino County, the original grade was constructed through virgin forests by convict labor. A narrow roadway following, in general, the contour of the country was turned over to the maintenance department as state highway. It was cut from the steep hillsides along the South Fork of Eel River, and originally in many places there was not room for two machines to pass.

Must Protect Traffic.

Increasing traffic is demanding wider and less tortuous roads, and it is evident this portion of the highway must be reconstructed before paving is considered. In the interim, the public must be protected. To construct a permanent, new standard guard rail would be money wasted, when the realignment takes place.

As a substitute, the log type guard has been tried with considerable success. Logs 18 inches to 30 inches in diameter are dragged to the narrow places and dangerous curves and placed along the outer edge of the roadway with approximately two-thirds of the diameter above the roadway surface. They are securely anchored or braced against nearby rocks, stumps or trees and are neatly jointed on the curves.

As a result, traffic may use the full available width of the roadway without fear of running off the edge of the grade. Observation revealed that, previous to placing the logs, the average motorist would not venture closer than three feet from the edge of the bluff.

Aid Drainage, Too.

Another important use of the log guard rail is as a drainage control. This has been thoroughly demonstrated on the recently completed section of grading between Trinidad and Orick, in Humboldt County.

Here, many of the embankments are composed of a sandy material which is very easily eroded. Early in the winter, it became apparent that much of the road would be destroyed if drainage on the fills could not be controlled. Logs were placed on the extreme edge of the shoulders, as previously described. This eliminated the possibility of storm waters washing away the edge of sandy fills, and in addition is providing a protection to traffic. Openings between the logs were made at low points in the grade and the storm waters directed over the slope of the fill in a flume, preventing erosion.

Approximately 3000 feet of these logs have been laid at a cost of approximately 33 cents per lineal foot.

The first Federal Aid law to get into road building was recommended by none other than Thomas Jefferson.—*Senator McKellar.*

Proposed Expenditures for 1925 Listed

THE California Highway Commission, during the recent legislative session, furnished the Revenue and Taxation Committee of the State Senate with its plan for the expenditure of construction funds for the remainder of the year 1925. The estimated cost of the projects proposed is $2,690,000.

The commission's program which is based upon estimated income from federal aid prior to January 1, 1926, as furnished the Senate committee, is as follows:

SAN BERNARDINO COUNTY—Victorville to Helendale. 20 miles, grading and surfacing, $200,000.

RIVERSIDE COUNTY—Mecca-Blythe route, grading and surfacing, 10 miles, $100,000; Coachella storm water bridge, $20,000.

IMPERIAL COUNTY—Brawley to Imperial, grading and surfacing, 8 miles, $125,000; El Centro to Holtville, grading and surfacing, 9 miles, $135,000; Holtville to Highline canal, grading and surfacing, 7 miles, $100,000; improvement Sand Hills, 6.5 miles, $300,000.

LOS ANGELES and VENTURA COUNTIES—From eight miles north of Santa Monica to Oxnard, surfacing graded sections and grading and paving Hueneme road to Oxnard (covers 35 miles), $535,000.

ORANGE COUNTY—Corona Del Mar to Serra, grading and surfacing, 14.5 miles, $435,000.

SAN DIEGO COUNTY—Mountain Springs grade, surfacing, 7 miles, $75,000; San Onofre and San Mateo Creek bridges, $230,000.

SIERRA and NEVADA COUNTIES—Floriston to Nevada state line, grading in Truckee River canyon, 6 miles, $200,000; three bridges and railroad grade separation in Truckee Canyon, $150,000.

TEHAMA COUNTY—Cooperative paving of gap in trunk highway through city of Corning, one mile, $40,000.

YOLO COUNTY—Cooperative railroad grade separation at west approach to Sacramento, $40,000; grading and paving .65 of a mile at west entrance to Sacramento, $25,000.

Total new construction for balance of 1925, $2,690,000.

Work to be Fairly Apportioned.

It will be noted that the greater number of projects are located in what has been designated the thirteen southern counties. In presenting its proposed expenditures to the Senate, the commission pointed to this fact and explained that during 1923 and 1924, particularly during 1924, by far the greater amount of new construction authorized was in the forty-five northern counties. In justice to the south, therefore, the bulk of the 1925 work will be done in that section of the state.

The legislature was informed that federal aid is now the commission's *only* source of income for new construction.

RECONSTRUCTION BUDGET FOR 1925.

Under present circumstances, the commission is expending for *reconstruction* of existing highways a larger amount than is involved in its program for new work. The reconstruction budget for the year 1925 totals $5,160,000 and is allocated in equal amounts to the thirteen southern counties and the forty-five northern counties.

The most necessary projects are being taken up in each section, but available funds are sufficient to care for less than half of the expenditures recommended as urgent by the division engineers.

The 1925 reconstruction program as approved by the commission is as follows:

MENDOCINO COUNTY—Leggett Valley to 2 miles north of Rock Creek, 6.3 miles, widening and resurfacing, $200,000.

SHASTA COUNTY—Half Way Creek to Dog Creek, 10.84 miles, widening Pacific highway; bridges across Salt Creek, Charley Creek, Doney Creek; $550,000.

SACRAMENTO COUNTY—American River to North Sacramento, .65 of a mile, paving; North Sacramento subways; $75,000.

GLENN COUNTY—Culverts over Central Irrigation Canal, $10,000.

YOLO COUNTY—Woodland Wye to Woodland, 8.33 miles, widening with cement concrete shoulders; Davis to Putah Creek, 4.47 miles, widening and thickening pavement; $160,000.

PLACER COUNTY—Surfacing and grading at Lake Tahoe, 14.1 miles; surfacing Tahoe City to Nevada line, 11.55 miles; $50,000.

EL DORADO COUNTY—Tallac to McKinney's, 6.3 miles, grading at points; Camino to 2 miles east of Sportsmen's Hall, 5.77 miles grading and surfacing; $50,000.

CONTRA COSTA COUNTY—San Pablo Creek to El Ciervo, 6.64 miles, widening with asphalt macadam shoulders, $150,000.

SAN MATEO COUNTY—Cypress Lawn Cemetery to San Bruno, 4.39 miles, widening pavement; through Daly City 1.2 miles, widening; $200,000.

SONOMA COUNTY—Santa Rosa to Healdsburg, 9.71 miles, widening and thickening pavement, $300,000.

MONTEREY COUNTY—San Lucas to King City, 8.5 miles, macadam shoulders; San Ardo to San Lucas, 11.5 miles, macadam shoulders; one mile north of Bradley to San Ardo, 12.9 miles, macadam shoulders; $100,000.

SANTA BARBARA COUNTY—Santa Barbara city to Montecito, 1.91 miles, widening pavement; Ortega Hill 1.42 miles, grading and surfacing; Rincon Hill, 1 mile grading and surfacing; $250,000.

MERCED, FRESNO and KERN COUNTIES—Buhach Canal to Livingston, 6.41 miles widening and thickening; Bakersfield to Lerdo, 8.21 miles, widening and thickening; Fresno to Herndon, 5.94 miles, cement concrete shoulders; $350,000.

LOS ANGELES COUNTY—Bridge across San Gabriel River; Montebello subway; improvement of alignment on Ridge Route; Montebello to Whittier, 3.34 miles, widening and thickening pavement; widening Ventura boulevard, 5 miles; $660,000.

SAN DIEGO COUNTY—Carlsbad railroad grade separation; Oceanside to 2 miles south of San Onofre, 15.70 miles, widening and thickening; 2 miles south of San Onofre to northerly boundary, 3.65 miles, grading and paving; $690,000.

VENTURA COUNTY—Extension of Ventura River bridge; Middle Rincon causeway one-tenth of a mile; paving Rincon seawall, 1.31 miles; $125,000.

SAN BERNARDINO COUNTY—San Bernardino to Redlands, 5.41 miles, widening and thickening pavement; Big Bear dam to Fawnskin, 3.25 miles grading and surfacing; $325,000.

RIVERSIDE COUNTY—Banning to Westmoreland, 15 miles, rock shoulders, $75,000.

SAN JOAQUIN COUNTY—New bridge over San Joaquin River at Mossdale; southerly boundary to Turner station, 11.5 miles, rebuilding pavement; $500,000.

MONO and INYO COUNTIES—Reconstruction at various places in Division IX, $75,000.

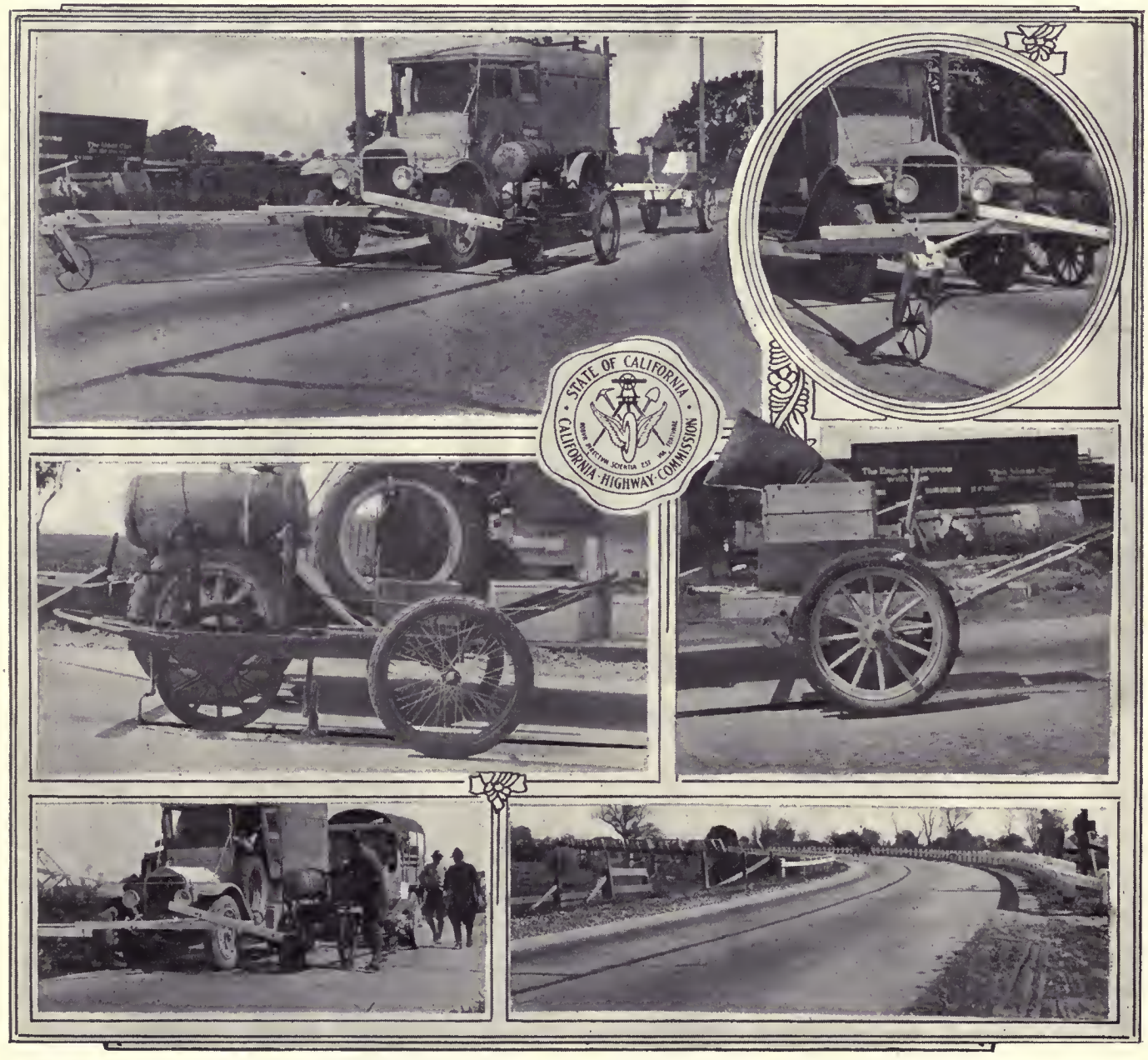
ORANGE COUNTY—San Juan Creek bridge; San Juan Creek to Galivan, 5.59 miles, widening and thickening pavement; $265,000.

Total reconstruction for 1925, $5,160,000.

INFORMATION ON CONTRACTS

The Bulletin, in the April issue, published a compilation of information on practically all contract work awarded or accepted as completed by the highway commission now in office. This issue contains a list of all contracts completed and accepted, awarded and pending award since the April issue. This information will be published monthly hereafter. See page fourteen of this issue.

DIVISION X SUPERINTENDENT BUILDS SUCCESSFUL PAVEMENT MARKER



THE BIXLER MARKER IN ACTION—*Upper left,* marker in operation showing truck and equipment; *upper right,* wheel guide which runs at edge of pavement; *left center,* close up of jet and brush in operation; *right center,* the sawdust distributor for protecting the freshly painted strip; *lower left,* marker in operation on levee road near Isleton, Sacramento County; *lower right,* work of the marker near Galt.

By R. E. Pierce, Assistant Division Engineer in charge of Maintenance.

NECESSITY proved the mother of invention recently when Division X desired to paint a traffic stripe along the expansion joint in the center of the new pavement between Sacramento and McConnells on the Upper Stockton highway.

A small hand machine was tried out but was discontinued because of the excessive amount of paint used; better and more economical results were desired. As a means to this end, Maintenance Foreman B. W. Bicksler, in charge of this section, was authorized to try and devise a machine that would be more satisfactory. After some experimenting, the outfit shown above was evolved. It consists of two units—one for painting the line and the other for distributing sawdust over the fresh paint to prevent its being smeared over the pavement by traffic.

Before the plan for covering the fresh paint with sawdust was worked out, it was found impossible to keep traffic from spoiling the looks of the job. An effort was made to correct this defect by sprinkling cement over the paint by hand. This proved very expensive and Mr. Bicksler suggested sawdust as a substitute.

It was first planned to operate the machine for spreading the sawdust by hand but later a scheme was worked out for attaching it to the truck, as shown in the illustrations.

Discarded Parts Are Useful.

The painting rig, shown in the close-up, consists of a frame supporting the paint container and mounted on three wheels; the front, or marker, is a discarded Ford wheel with a felt-covered rim. We have two of these, interchangeable, one having a rim 4 inches and the other a rim 6 inches in width. The other two wheels were taken from a discarded motorcycle. The container is an old truck gas tank and at first was used as a pressure tank to spray the paint onto the marking wheel. This proved unsatisfactory, and the paint now flows down a small pipe by gravity and pours onto the pavement immediately in front of the marking wheel. A cut-off valve is attached to a long lever so it can be operated by the one pushing the machine. Behind the marking wheel, two paint brushes are placed so as to smooth the paint and work it into the pavement.

The sawdust distributor consists of a bin for holding the sawdust mounted on a pair of old Ford wheels. Two small wooden wheels connected by an axle with an eccentric are fixed so that they can be brought to bear against the large wheels. The eccentric is connected by a rod with a tin trough under an opening in the sawdust bin, agitating it and causing the sawdust to fall onto the freshly painted mark. A burlap sack is dragged behind to spread the sawdust evenly.

The line is kept straight by an out-rigger with a small wheelbarrow wheel so placed as to be easily seen by the truck operator. It is run along the outside edge of the pavement as a guide. The marking machine is fastened to the front of the truck and the sawdust distributor to the rear. They may be adjusted to mark any width of pavement.

Recently, we painted five miles of the pavement from the Isleton bridge to the Rio Vista bridge, on the levee road in the Sacramento delta, and found that we could average about two miles per hour with a three-man crew.

Cost Per Mile.

The cost of the work per mile was as follows:

Labor:	
Three men at $1.75 per hour for one-half hour	$0 87½
Truck rental at $0.75 per hour for one-half hour	37½
Materials:	
6 gallons asphalt paint at 12½c	75
10 sacks sawdust at 12½c	1 25
Gas, oil, etc.	75
Average cost per mile	$4 00

The asphalt paint is made by dissolving asphalt in gasoline. A clean-cut job free from smearing is secured by using this apparatus, and it is our intention to paint a white stripe on the asphalt roads of the division later in the year.

LEGISLATION AFFECTING HIGHWAYS BEFORE THE 68th CONGRESS

THE LAST congress had before it several matters of legislation affecting highways. As usual, more bills were introduced than became laws. The following were of most general interest.

Bills Which Became Laws.

Dowell Bill (H. R. 4971), authorizing appropriations under the Federal Highway Act $75,000,000 for the fiscal year 1926, $75,000,000 for fiscal year 1927; and for forest roads and trails $7,500,000 for the fiscal year 1926 and $7,500,000 for the fiscal year 1927. This bill also makes organic law that all authorizations for roads shall hereafter be apportioned to the states by the Secretary of Agriculture on January 1 of each year. Nontaxable Indian lands are hereafter to be considered as "unappropriated public lands" in the operation of the Federal Highway Act.

Temple Bill (H. R. 4522), to complete topographic survey of the United States.

Reece-Capper Bill (H. R. 7269) directs the Secretary of War to transfer to the Secretary of Agriculture 100 5-ton tractors and 1000 trucks for use on roads.

Pan American Congress of Highways (S. J. Res. 190), authorizes the President of the United States to appoint a commission of five to attend the Pan American Congress of Highways at Buenos Aires October 3, 1925. This congress is the result of the visitation made in June of last year to this country of representatives of all the Pan American countries who visited many of our highways under the escort of the State highway departments.

Bills Which Did Not Become Laws.

Colton Bill (H. R. 6133). This bill provided that in the case of any state containing unappropriated public lands exceeding 5 per centum of the total area of all lands in the state in which the population does not exceed 10 per square mile of area, federal aid up to 100 per cent may be used on the primary system.

Also in the case of any project involving construction in mountainous, swampy, or flood lands on which the average cost per mile for the grading and drainage structures other than bridges of more than 20 feet clear span, will exceed $10,000 per mile; and also in the case of any project which, by reason of density of population or character and volume of traffic, the state highway department and the Secretary of Agriculture may determine should be improved with a surface of greater width than 20 feet, the Secretary of Agriculture may pay more than $15,000 per mile. In no event shall the payments of federal funds on any project under this proviso exceed 50 per centum of the cost of the project, except as such payments are authorized to be increased in the public-land states.

That in apportioning appropriations for forest roads no state entitled to share in such appropriations shall receive less than $20,000 of each year's allotments. This bill will be reintroduced in the next congress.

Naming Oregon Trail (S. 2053). Passed Senate, died in Committee on Roads of the House after extensive hearings.

Reorganization Bill (H. R. 9629). This bill provided for the transfer of the Bureau of Public Roads to the Department of the Interior and the creation of a new Department of Transportation in the Department of Commerce. This bill did not get to the floor of either House of Congress. It will be reintroduced in the next congress.

Denison Bill (H. R. 10468). This bill proposed granting privilege of erecting toll bridges under certain restrictions. No action was taken in either house of congress. Will be reintroduced in the next congress.—*American Highways.*

Ignorance.

A congressman's wife, waking him in the middle of the night, told him that there were robbers in the house.

"Impossible," said the congressman. "There may be robbers in the Senate, but not in the House."—*Florida Times-Union.*

LEGISLATIVE REVIEW NEXT MONTH.

The June issue of the Bulletin will contain a complete review of new highway legislation which will become effective as a result of the recent session of the legislature and executive approval. The period during which the Governor may sign bills does not expire until May 29th.

WHAT THE DIVISIONS ARE DOING

DIVISION I CELEBRATES OPENING OF NEW SMITH RIVER HIGHWAY

THE FORMAL opening of the first section of the Smith River highway between Adams Station and Patricks Creek, Del Norte County, was celebrated with a barbecue at the latter point on May 10th. Temporary bridges have been completed and the road is now open to traffic. After a recent trip of inspection, Commissioner Louis Everding declared the new water level grade along the river the most beautiful highway in California.

Many citizens from all parts of Del Norte County and from Grants Pass and other points in Oregon participated in the celebration.

Temporary Road Built.

The section of the road now open eliminates fifteen miles of narrow, steep and rough mountain road. Three miles of temporary road up Patricks Creek, recently completed by the Division, affords a connection between the new construction and the county road. The opening of the road all the way through to the Oregon line is expected during 1926.

The section opened was built by the Bureau of Public Roads with funds furnished by the California Highway Commission and the United States Forest Service and is an important part of the Grants Pass interstate connection. Another section of seven miles is under construction by convict labor.

There have been additional slides in Division I, due to late rains, but maintenance crews have kept the highway open to traffic. The rainfall at Willits is expected to exceed sixty inches for the season.

LATE RAINS REDUCE MAINTENANCE COSTS REPORTS DIVISION II

LATE RAINS throughout the northern counties have considerably reduced maintenance costs in Division II. Sprinkling carts will not be in service until a month later than usual, and spring maintenance has been made more effective in preparing the roads to carry the heavy traffic expected during the coming summer.

The most important maintenance activity of the division at the present time is the preparation of some forty-eight miles of the Pacific highway for an application of calcium chloride. The work has been completed on ten miles immediately south of the Oregon line and the work on the entire section is scheduled for completion by June 1st.

New Highway Excellent.

Reconstruction contracts—widening and straightening—on the Pacific highway in this division accepted as complete by the commission during March are fully measuring up to expectations. The ease and safety with which traffic is handled over these sections is comparable with valley highways.

The Nevada Contracting Company is making excellent progress on the contract for the reconstruction of eleven miles of the Pacific highway between Halfway Creek and Dog Creek. Three power shovels are working a double shift. In addition, a 50-man culvert crew is busy and a rock crushing plant is in operation. Completion of this section before next winter is predicted.

DIVISION III PLANS WORK ON HIGHWAY IN TAHOE SECTION

DIVISION III is making preparations to resume the widening and surfacing of state highways along the shores of Lake Tahoe, discontinued during the winter months. Widening work will be done at the south end of the lake and surfacing will be placed between Tahoe City and Brockway, on the northern shore. State equipment stored at Carnelian Bay will be used on the latter project.

Concrete bridges on the state highway in Butte County, built by the county a number of years ago, will be resurfaced with asphalt concrete in the near future.

Screenings have been placed on the state highway between Auburn and Colfax and plans are being made for the laying of an oil macadam surfacing during the coming summer to prevent raveling.

Fill is Completed.

The sand fill at the north end of the American River bridge between Sacramento and North Sacramento, the first step in the rebuilding of the state highway between these two cities, has been completed.

Spring grading on valley roads has been completed and similar work is now under way on the foothill and mountain roads which are being dragged and placed in condition for traffic.

Division III is looking forward to the establishment of a system of permanent maintenance stations and the purchases of sites in Truckee, Colfax, Marysville, Willows, Williams, and Chico is under consideration.

DIVISION IV IMPROVES ROADS IN CALIFORNIA REDWOOD PARK

THE maintenance forces of Division IV, during the past winter, have completed important improvements on the state roads leading to and within the California Redwood Park in Santa Cruz County. Considerable straightening of the roadway and daylighting of blind curves has been done. Plans were made for keeping the road well sprinkled during the period of heavy summer traffic.

Widening of the Boulder Creek highway has been resumed by state forces and if funds permit the work will be continued during the summer. Traffic on this popular route is becoming heavier each year.

Surfacing to be Stock Piled.

The division is planning the purchase and stock piling along the Pacheco Pass highway of 10,000 cubic yards of gravel to be used for maintenance purposes.

Placing of concrete shouders on either side of the existing pavement on the state highway through Daly City has been completed. A local road district financed sidewalks and curbs, and with the work done by the division the state highway through the town presents a much improved appearance.

Division Engineer J. H. Skeggs recently joined with Division Engineer L. H. Gibson and County Engineer H. F. Cozzens of Monterey County in investigating the possibility of building an improved highway from Hollister to King City by way of the Pinnacles National Monument.

PISMO RIGHTS OF WAY SECURED

RIGHTS OF WAY for the proposed line change and railroad grade separation on the Coast highway at Pismo Beach, San Luis Obispo County, Division V, are in such shape the work can be advertised for contract, and it is probable bids will be asked during the present month. Rights of way either have been purchased outright or funds posted in court and an order of possession secured. Attorney Paul F. Fratessa represented the commission in the court proceedings. The division's plans are now at headquarters.

Division Engineer L. H. Gibson has had maintenance forces busy removing slides from the San Simeon highway, north of

Loading apparatus used by maintenance crew on small shoulder widening jobs. (Division II.)

Cambria. The new grade will be placed in condition for travel to its present terminus at Salmon Creek.

MUCH WORK UNDER WAY AND IN PROSPECT IN DIVISION VIII

ACTIVITIES in Division VIII—San Bernardino, Riverside and Imperial counties, are on the increase. Surveys are being made and rights of way secured for several grading contracts in the Imperial Valley, paving is under way in San Bernardino County, and bids are pending for additional contracts. H. G. Fenton, contractor on the Brawley-Imperial grading job, is making strenuous efforts to get as much work done as possible before the period of hot weather.

The state and the town of Westmoreland are cooperating in paving the highway through the business district and the Pioneer Transfer Company is striving to complete the work before summer.

The contract of Basich Brothers for paving on the trunk line highway between the San Bernardino County line and Beaumont is well under way and rapid progress is being made.

The contract through the town of Barstow is now complete and open to traffic and a very striking improvement has been made. The new road eliminates a number of exceedingly dangerous grade crossings in the Santa Fe yards and over its main line tracks. The distance is considerably reduced.

RECONSTRUCTION PROJECTS GETTING UNDER WAY IN DIVISION X

WIDENING of the state highway between Davis and Woodland and also between the Winters Wye and Putah Creek, in Divisions X and III, is now under way. Concrete shoulders are being placed by the Kaiser Paving Company and between the Winters Wye and Putah Creek an asphalt concrete surfacing over the old fifteen-foot slab is being placed by Force and Currigan. From the Woodland Wye to Davis, the new width will be twenty-seven feet. The city of Davis is considering paving the highway the full width of the street through the city limits. Kaiser has a central mixing plant at Davis. C. M. Butts is in charge for the state.

San Joaquin Paving Gets Started.

Between Ripon and Turner Station, in San Joaquin County, J. F. Knapp is starting operations on the placing of 2.7 miles of flush concrete shoulders and 8.9 miles of new concrete pavement. The new pavement will be twenty feet wide with an oil macadam subbase.

A central proportioning plant and an industrial railroad will be used on this job. C. W. Springer is temporarily in charge for the division.

With more favorable weather at hand, R. N. Murdock is making better progress on the grading of the Alpine state highway between Jackson and Pine Grove. The project is about 50 per cent complete.

Shoulder Widening.

State forces under C. Bovey are completing some important shoulder work on the trunk line between Tracy and the westerly boundary of San Joaquin County. Material from an abandoned levee is being hauled for filling of roadside ditches and extension of shoulders. The highway has been made much safer and its appearance greatly improved.

New Experiment in Piles.

The maintenance forces of Division X are trying out an experiment at the Rio Vista bridge. The trestle approach, damaged during the high water of last winter, is being repaired, using Eucalyptus trees for piling.

Informal bids have been asked for the crushing and stock piling of 10,000 cubic yards of gravel on the lateral near San Andreas.

Crushed rock has been placed along the shoulders in Yolo County, east of the Causeway, and west of Cordelia in Solano County. Wooden wheel guards have been placed on several concrete bridges in the latter county.

Maintenance forces are busy opening the mountain roads and late showers have been keeping grading crews on the jump.

FIFTEEN-FOOT PAVEMENTS RAPIDLY BEING WIDENED IN DIVISION VII

WHEN the contract for the widening and thickening of 5.6 miles of the highway between San Juan and Galivan, Orange County, Division VII, is completed it will mark the reconstruction of the last of the original fifteen-foot state pavement in Orange County. The reconstruction program of the commission is fast putting an end to the old, narrow and dangerous pavements in populous sections of southern California.

Two new subcontractors, each with a gasoline shovel, have started work on the Malibu Ranch grading contract north of Santa Monica, and the work is going ahead with greater rapidity than ever before. The day labor camp which has been in operation on this section of the Coast boulevard for over a year, having completed the work assigned it, has been discontinued.

With the exception of a 1000-foot extension at Laguna Beach, now under way, the McCray contract for the grading of the Corona Del Mar-Laguna Beach section of the Coast boulevard has been completed and accepted.

State forces have completed the grading of the approaches to the new state highway bridge over the north arm of Newport Bay and the structure, which was built by Orange County, is now open to traffic, rendering the crossing of the bay by ferry unnecessary.

BRIDGE DEPARTMENT NEWS

BY THE TIME this is in print work will have started on one of the worst single situations on the state highway system, the elimination of two dangerous grade crossings between Sacramento and North Sacramento. Lord and Bishop, contractors, plan to carry on the work simultaneously on the two underpasses which, with the ground level pavement to be built by Division III, will eliminate the present wooden trestle at this point.

The State Railroad Commission has authorized the construction of an underpass under the tracks of the Union Pacific Railroad near Montebello on the Whittier boulevard, Los Angeles County, one of the heaviest traffic arteries on the state system. The total width of the roadway will be 61½ feet which will provide two 30-foot one-way roadways for traffic. The cost of the structure will be heavy and will be shared by the state, county and the railroad.

Work is starting on the San Juan Creek bridge, Orange County. A. J. Meehan is resident engineer representing the bridge department.

Construction is well under way on the Salt Creek bridge on the Pacific highway, Shasta County. A. S. Kennedy is resident engineer on this project. A detour bridge for handling traffic is in place.

Children to be Protected.

A safety pedestrian way for school children and workmen who are forced to cross the bridge daily will be provided by the sidewalk now under construction in connection with the repairing of the bridge across Eel River on the Redwood highway, near Scotia, Humboldt County. Work has been started by Henry Padgett, contractor. A new floor is being placed. Increasing traffic made necessary the use of the entire width of the roadway of the bridge for vehicle traffic. H. M. Sturges is resident engineer.

C. O. Dingle has completed his work at the Simmons Creek bridge, San Luis Obispo County, and has been assigned to the San Gabriel River bridge, Los Angeles County.

Albert A. Lernhart, recently in charge at the Van Duzen River bridge on the Redwood highway, is now resident engineer on the Polaris crossing, in the Truckee River canyon, Nevada County. Construction has been resumed on this bridge.

Milton E. Whitney has been transferred from the Ventura seawall job to the Cottonwood Creek bridge in Kern County, taking the place of G. W. Thompson who is now in charge at the seawall.

Albert B. Willitt will be in charge of the construction of the San Gorgonia Wash structure in Riverside County.

J. B. Hodges will be resident engineer on the Ventura River bridge extension after he completes final reports on the Santa Ana River and Newport Bay bridges built by Orange County under state supervision.

J. H. Orr, J. M. Lackey and J. P. Winslow are engineers recently added to the staff of the bridge department.

Leo Fahy has been placed in charge of the department's clerical work, having been transferred from the accounting department. Miss Grayce Maddox is cashier.

MOTOR VEHICLE FUND CONTRACTS (Including Gasoline Tax Fund)

COMPLETED AND ACCEPTED SINCE APRIL 6, 1925.

Cont. No.	Division	County	Route	Sec.	From	To	Miles	Type	Contractor	Estimated cost	Date Contract approved by Attorney General	Contract time, days
M-59	III	Glenn	45-7	A	Central Irrigation Canal			Concrete Culverts	Ottn Parlier	$17,195 63	Jan. 3, 1925	60
					AWARDED SINCE APRIL 6, 1925							
M-67	III	Sacramento	3	B	At Sacramento Northern Railroad Crossing			Underpass	Lord & Bishop	23,319 00	April 15, 1925	125
M-68	III	Sacramento	3	B	At Western Pacific Railroad Crossing			Underpass	Lord & Bishop	44,881 88	April 15, 1925	125
M-69	VI	Fresno	4	C	2 miles north of Fresno	Herndon	5.92	Concrete Shoulders	Stewart & Bland	45,685 91	April 15, 1925	90
M-70	VII	Orange	2	A	At San Juan Creek			Bridge	Stevens Bros. & Haas	28,773 68	April 15, 1925	150
M-71	I	Humboldt	1	E	Eel River Bridge			Sidewalk	Henry Padgett	19,890 00	April 15, 1925	100
M-72	V	Santa Barbara	2	J	Ortega Hill	Santa Barbara	1.6	Concrete Pavement and Surfacing	Cornwall Constr. Co.	60,075 90	May 4, 1925	100
M-73	VII	Los Angeles	2	D	At San Gabriel River			Bridge	Chas. and F. W. Steffgen	92,575 20	May 4, 1925	200
M-74	VII	Orange	2	A	San Juan Creek	Galivan	5.59	Concrete Pavement	Jahn & Bressi	181,687 03	May 4, 1925	125
M-75	IV	Contra Costa	14	A-B	San Pablo Creek	El Ciervo	6.64	Resurface and Widen	Kaiser Paving Co.	155,102 96	May 4, 1925	175
M-76	VII	Los Angeles	4	A	Various locations			Paint Four Bridges	D. E. Burgess	7,882 03	May 4, 1925	125
M-77	I	Mendocino	1	J	Leggett Valley	2 miles North of Rock Creek	6.3	Grade and Gravel	Butterfield Sears Co.	219,118 61	May 4, 1925	400
M-78	IV	San Mateo	2	A	Cypress Lawn Cemetery	San Bruno	4.39	Concrete Shoulders	Federal Paving Co.	230,546 39	May 4, 1925	150
						Sub-total	30.44			$1,109,538 59		
					PENDING AWARD							
	VII	San Diego	2	D	San Onofre	Westerly boundary	3.65	Concrete Pavement		$134,223 88		
	VII	Ventura	2	D	Ventura River Bridge			Bridge Extension		17,985 38		
	I	Humboldt	1	C-E-G	Various			Painting Five Bridges		56,952 00		
	III	El Dorado	11	E-F	Camino	2 miles east Sportsmans Hall	5.8	Grade and Gravel		51,464 34		
	VI	Kern	4	D	Beardsley Canal	Lerdo	8.2	Shoulders and Surface		155,006 30		
						Total Motor Vehicle Fund awarded and pending award	48.09			$1,525,170 49		

NOTE—The above obligations charged against the motor vehicle and gasoline tax funds do not include funds from these sources obligated for general maintenance and for specific betterments not being done under contract.

STATE HIGHWAY FUND CONTRACTS (Bond Funds, Including Federal Aid)

COMPLETED AND ACCEPTED SINCE APRIL 6, 1925.

Cnnt. No.	Division	County	Route	Sec.	From	To	Miles	Type	Contractor	Estimated cost	Date Contract approved by Attorney General	Contract time, days
440	I	Humboldt	1	F	Across Van Duzen River near Alton			Reinforced Concrete Bridge	Bordwell & Zimmerman	$110,937 25	April 16, 1924	250
459	V	San Luis Obispo	33	B	Simmons Creek			Bridge	C. C. Gildersleeve	5,745 15	Nov. 15, 1924	90
460	VIII	San Bernardino	31-58	F-E	½ mile west of Barstow	1 mile east of Barstow	2.32	Grading	H. M. Henning	15,046 83	Dec. 13, 1924	60
461	VIII	Imperial	27	B	Yuma Project Main Canal			Timber Trestle	W. M. Ledbetter & Co.	7,371 00	Dec. 13, 1924	90
						Total State Highway Fund jobs completed and accepted	2 32			$139,100 23		
					AWARDED SINCE APRIL 6, 1925							
466	VII	San Diego	2	D	San Onofre Creek			Bridge	Fluor Construction Co.	$62,118 28	May 4, 1925	125
					PENDING AWARD None							

NOTE—Primary construction covered by the above contracts does not include funds obligated on cooperative forest highway projects, prison road camp activities, or day labor jobs not being done under contract.

HIGHWAY NEWS NOTES

Loses Life in Kern River.

FRANK T. DAVIS, timekeeper, Division VI, lost his life in the Kern River on April 30th when he volunteered to swim the river to locate a bench mark on the opposite side for engineers working in connection with the prison road camp. He had been employed by the commission for four years and had an excellent record.

Division III Man Promoted.

A. R. McEwen, assistant resident engineer, has been promoted to resident engineer on the Boca to Floriston grading contract in the Truckee River Canyon.

C. W. Rust is acting as assistant resident engineer in charge of the grading and graveling job west of Williams, Colusa County.

Otto Hadley has been appointed clerk-stenographer at the Division III shop.

News From the Redwood Country.

H. C. Ingle, resident engineer on the Eureka-Arcata paving contract, Division I, has been transferred to Division VIII and is in charge of the paving through the town of Westmoreland.

C. F. Oliphant, draftsman in Division I, has been transferred to Livingston, Division VI, as assistant resident engineer.

A. E. Shaffer, formerly with the State Motor Vehicle Department in Sacramento, has accepted a position with the Division office at Willits.

Transferred to South.

R. W. Van Stan and M. L. Johnson, assistant resident engineers, have been transferred from Division II to Division VIII, and are located at Westmoreland and Brawley, respectively.

Forces Increased in South.

FORMER Division VI engineers, who have been transferred to Division VIII because of the increased construction program to be placed under way there, are R. A. Westbrook, F. A. Read, J. M. Hollister, Herbert Gladrow, J. V. Garrison, and Donald J. Stout.

Assists in Convict Hunt.

R. A. Watkins, equipment superintendent with Division X, made an airplane flight recently to assist the Sacramento police authorities in their hunt for two escaped convicts.

B. K. Lehman, formerly of headquarters, has been appointed clerk in the Division X equipment department.

Highway Engineer Honored.

R. E. Pierce, assistant division engineer, Division X, has been elected president of the Sacramento Chapter of the American Association of Engineers and also delegate to the national convention of the association.

Changes in Division VII.

C. N. AINLEY, resident engineer on the recent work between Newport and Laguna, has been assigned to the Jahn and Bressi reconstruction contract between San Juan and Galivan, Orange County.

Assistant Division Engineer J. C. More has been elected vice president of the Los Angeles chapter of the American Association of Engineers.

M. L. Sullivan, superintendent in charge of line changes on the Ridge Route, has recovered from a severe attack of influenza and pneumonia.

W. D. Eaton will be resident engineer on the San Mateo-San Onofre Creek line change.

E. T. Scott, maintenance superintendent, is the proud father of a brand new son.

H. C. Gladrow, recently transferred from Division VIII, has been assigned to the party of L. G. Corey on the Hauser contract.

It is beginning to look as though all the draftsmen of the future will be women. Forrest Manhart, of headquarters, is the proud daddy of a bouncing baby girl.

Highways and reforestation should continue to have the interest and support of the government.—*President Coolidge.*

UNIFORM MARKING SYSTEM FOR U. S. HIGHWAYS CONSIDERED

AGREEMENT was reached in Washington, D. C., April 21st, at the closing session of the meeting of the joint board of state and federal highway officials to create a group of interstate roads to be known as "United States Highways," which will be designated with uniform markers.

Final decision on the selection of the highways and the style of signs will be reached August 3d, when the board is to meet in Washington again after a series of regional meetings throughout the country to receive the recommendations of state highway officials.

The first regional meeting was held on the Pacific coast May 15th and 16th at San Francisco. Others will be held in the Mississippi Valley, probably at Kansas City; in the upper Mississippi Valley, probably at Chicago; in the east, probably at New York, and in the southeast, probably at Atlanta.

Policy Regarding Trail Associations.

The board adopted the policy of the American Association of State Highway Officials concerning the trail associations, by agreeing not to oppose "reputable trails' associations" now existing provided their activities do not conflict with state and federal policies.

R. M. Morton, State Highway Engineer of California, is a member of the board which was appointed recently by the Secretary of Agriculture. He was unable to attend the Washington meeting but was present at the western session in San Francisco.

STANDARD OIL REPRESENTATIVE COMMENDS MECCA-BLYTHE WORK

THE MECCA-BLYTHE state highway in eastern Riverside County, connecting the Coachella Valley with the Palo Verde Valley, was taken over for maintenance by the commission on January 1, 1925. With the exception of its terminni, the road is mostly over desert sands. The work that is being accomplished by the maintenance forces of Division VIII is attracting attention.

The following letter has been received by Commissioner N. T. Edwards from C. W. Stewart, a representative of the Standard Oil Company in southern California:

STANDARD OIL COMPANY
Sales Department
LOS ANGELES, CALIFORNIA, April 11, 1925.

MR. N. T. EDWARDS,
California Highway Commission,
Pacific Finance Building, Los Angeles, Cal.

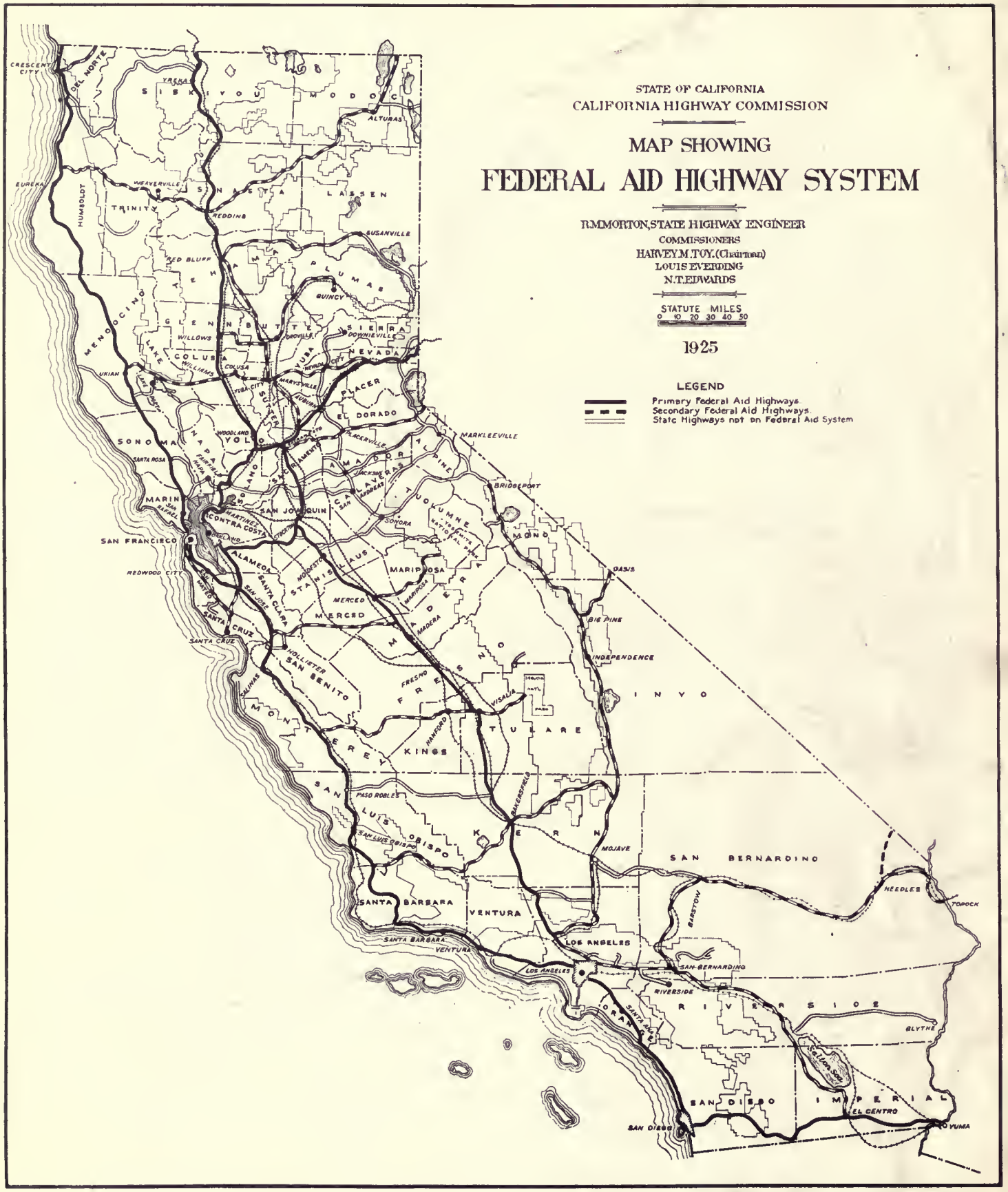
MY DEAR MR. EDWARDS: I have just returned from a trip to Blythe and I want to take this opportunity of congratulating the State Highway Department on the wonderful improvement of the desert road between Mecca and Blythe since I was last over it, some three months ago.

It is now possible for a person to make excellent time crossing the desert and at the same time to arrive physically fit.

The good work of the State Highway Department on this road is deserving of the highest commendation of the traveling public.

Sincerely yours,
(Signed) C. W. STEWART.

State maintenance of the Mecca-Blythe highway, the results of which are discussed in the above letter, has been made possible by the maintenance fund created by the passage of the 1923 gasoline tax law.



The above map shows the federal aid highway system of California in its relation to other state highways. The roads shown on this map constitute the present state highway system, except in one or two minor particulars where the federal aid system includes short sections not designated state highways.

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CALIFORNIA HIGHWAYS

A BULLETIN ISSUED BY THE CALIFORNIA HIGHWAY COMMISSION FOR THE INFORMATION OF ITS EMPLOYEES AND THE PUBLIC

Vol. 2 JUNE, 1925 No. 6

WHERE TESTS BRING OUT THE TRUTH ABOUT MATERIALS FOR CALIFORNIA HIGHWAYS—*Upper left,* Laboratory Building, Sacramento; *upper right,* Physical Laboratory, compression machines of 50,000 and 200,000 pounds capacity; *right center,* Physical Laboratory, concrete storage tank for curing cement and concrete specimens; *lower left,* Chemical Laboratory, centrifuge, distillation apparatus, etc.; and *lower right,* Physical Laboratory, preparation room, battery of drying ovens.

In this issue: DETERMINING THE QUALITIES OF SHOULDER MATERIALS BY LABORATORY TESTS—STANDARD SPECIFICATIONS FOR FUTURE CONSTRUCTION.

CALIFORNIA HIGHWAYS

HARVEY M. TOY, Chairman;
N. T. EDWARDS and LOUIS EVERDING, Commissioners.

ROBERT M. MORTON, State Highway Engineer.

W. F. MIXON, Secretary.

We are pleased to permit publication of any of the matter contained herein or to loan cuts and this privilege is extended newspapers and periodicals without restrictions.

FRANK B. DURKEE - - - Editor
P. O. Box 1103, Sacramento, California.

Vol. 2 June, 1925 No. 6

CALIFORNIA HIGHWAY DEPARTMENT

CALIFORNIA HIGHWAY COMMISSION

HARVEY M. TOY, Chairman, San Francisco

N. T. EDWARDS, Commissioner, Orange

LOUIS EVERDING, Commissioner, Arcata

R. M. MORTON, State Highway Engineer, Sacramento

PAUL F. FRATESSA, Attorney, San Francisco

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G. R. WINSLOW, Maintenance Engineer

HARLAN D. MILLER, Bridge Engineer

R. H. STALNAKER, Equipment Engineer

L. V. CAMPBELL, Office Engineer

BEN H. MILLIKEN, Superintendent of Convict Road Camps

HERMAN B. WEAVER, Chief Accountant

LOWELL R. SMITH, Purchasing Agent

DIVISION ENGINEERS

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H. S. COMLY, Division II, Redding
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J. H. SKEGGS, Division IV, San Francisco
L. H. GIBSON, Division V, San Luis Obispo
J. B. WOODSON, Division VI, Fresno
S. V. CORTELYOU, Division VII, Los Angeles
E. Q. SULLIVAN (Acting), Division VIII, San Bernardino
F. G. SOMNER, Division IX, Bishop
J. C. McLEOD, Division X, Sacramento

General Headquarters, Fifth Floor, Forum Building, Sacramento

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NEW ROAD OPENS ANOTHER PARADISE

(From the Los Angeles Examiner.)

THE EXCELLENT road which the state has built between Mojave and Bishop as a substitute for the desert trail formerly existing has brought the Owens Valley and the High Sierras at least eight hours nearer to Los Angeles. This is one of the most important highway improvements within recent years, vastly extending the motorist's southern California and bringing into convenient travel distance one of the most marvelous scenic regions and playgrounds in the world. * * *

The old road was described by motorists, perhaps truthfully, as the worst in the state. The new one, following the same route along the Los Angeles aqueduct, is in splendid shape for vacation travel.

Perhaps there has not been a finer example of the magic of a good road than this. There is nothing that unlocks the doors to that treasure house of California's immense natural wealth like well-built highways.

ROADS GOOD

(From the Inyo County Register, Bishop.)

MAINTENANCE forces on the highways under Division Engineer Somner's direction are doing work that wins praise from many motorists who travel them of late. Toward Mono Lake, via Long Valley, the road is pronounced in splendid condition with the exception of one very short detour, and that was to be remedied this week. To the south, Mojave is now reached over the best highway that has ever existed on that route, and motorists are making, as a daily occurrence, time that used to be considered remarkable. It is the very general opinion that the Highway Commission did this slope a great favor indeed in allotting Division IX so competent and result-getting an officer as Mr. Somner.

The Exact Difference.

"Father," said the conventional small boy, "what is the difference between a pedestrian and a jay-walker?"

"A pedestrian," returned the conventional father, "is a person who walks when you are walking. A jay-walker is a person who walks when you are driving."—*The Kablegram.*

JUNE 1925

California Highways

VOL. 2 NO. 6

"BIND THE REPUBLIC TOGETHER WITH A PERFECT SYSTEM OF ROADS"

LET IT NOT BE SAID that internal improvements may be wholly left to the enterprise of the states and of individuals. I know that much may be justly expected to be done by them; but in a country so new and so extensive as ours there is room enough for all the general and state governments and individuals to exert their resources. Many of the improvements contemplated are on top great a scale for the resources of the states or of individuals, and many of such a nature that the rival jealousy of the state, if left alone, might prevent. They require the resources and the general superintendence of the government to effect and complete them.

But here are higher and more powerful considerations why congress should take charge of this subject. If we were only to consider the pecuniary advantages of a good system of roads and canals, it might indeed admit of some doubt whether they ought not to be left wholly to individual exertions; but when we come to consider how intimately the strength and political prosperity of the Republic are connected with this subject, we find the most urgent reasons why we should apply our resources to them. Good roads and canals, judiciously laid out, are the proper remedy. *Let us, then, bind the Republic together with a perfect system of roads and canals.*

The fund proposed to be set apart in this bill is about $650,000 a year, which is doubtless too small to effect such great objects of itself, but it will be a good beginning. Every portion of the community—the farmer, the mechanic, and the merchant—will feel its good effects; and, what is of greatest importance, the strength of the community will be greatly augmented and its political prosperity rendered more secure.—*From an address by John C. Calhoun before the House of Representatives, 1817.*

A GREAT deal is being said these days about federal aid for highways. The charge has been made that it is in violation of the principle of states' rights; that under that doctrine the states should assume the entire obligation for the building of the highways of the nation. The above quotation from an address by the greatest of all advocates of the rights of the states proves he held a different view.

The need for "binding the Republic together with a perfect system of roads" is as urgent now as it was a hundred years ago. In fact, in this age of motor transportation, it is more urgent. Federal aid will make it possible.

NEW LAW CHANGES STATE'S HIGHWAY POLICY

CONSTRUCTIVE changes in the highway policy of California are embodied in Assembly Bill 589 (Melville), approved by Governor Richardson May 19th, to be in effect July 24th (Chap. 234, Laws of 1925). The measure codifies and clarifies provisions of the Political Code governing powers and duties of the California Highway Commission, and adds several new and important sections, including one directing the commission to take over for maintenance all traversable state highways.

Such action was recommended by the commission in its last biennial report and also was approved by the Highway Investigating Committee. It had the endorsement of the Supervisors' Association of the state and many civic organizations.

All question of the legality of the expenditure of maintenance funds on unconstructed state highway routes is now swept aside. The 1925 maintenance funds are allocated but plans are being made to comply with the legislative authorization during 1926. As fast as the work can be properly organized, trained maintenance crews of the commission will extend some measure of relief to those communities that have waited patiently since the first bond issue for improved highway service.

Betterment Now Possible.

Gradual betterment of mountain laterals will now be possible, and, in the course of a few years, improved traffic conditions may be expected, which will serve until such time as final construction can be undertaken.

This action upon the part of the legislature and the Governor should make possible a greater concentration of funds available for new work on the main trunk lines and important interstate connections, and result in a more orderly and logical construction of the uncompleted portions of the state system.

Construction Through Small Towns.

The Melville bill also directs the commission to construct the state highway through all municipalities of 2500 population, or less, to the same standards as the highway approaching such cities and towns. Under this provision many uncompleted gaps in state pavements will be closed, adding to the comfort and convenience of users of the highways.

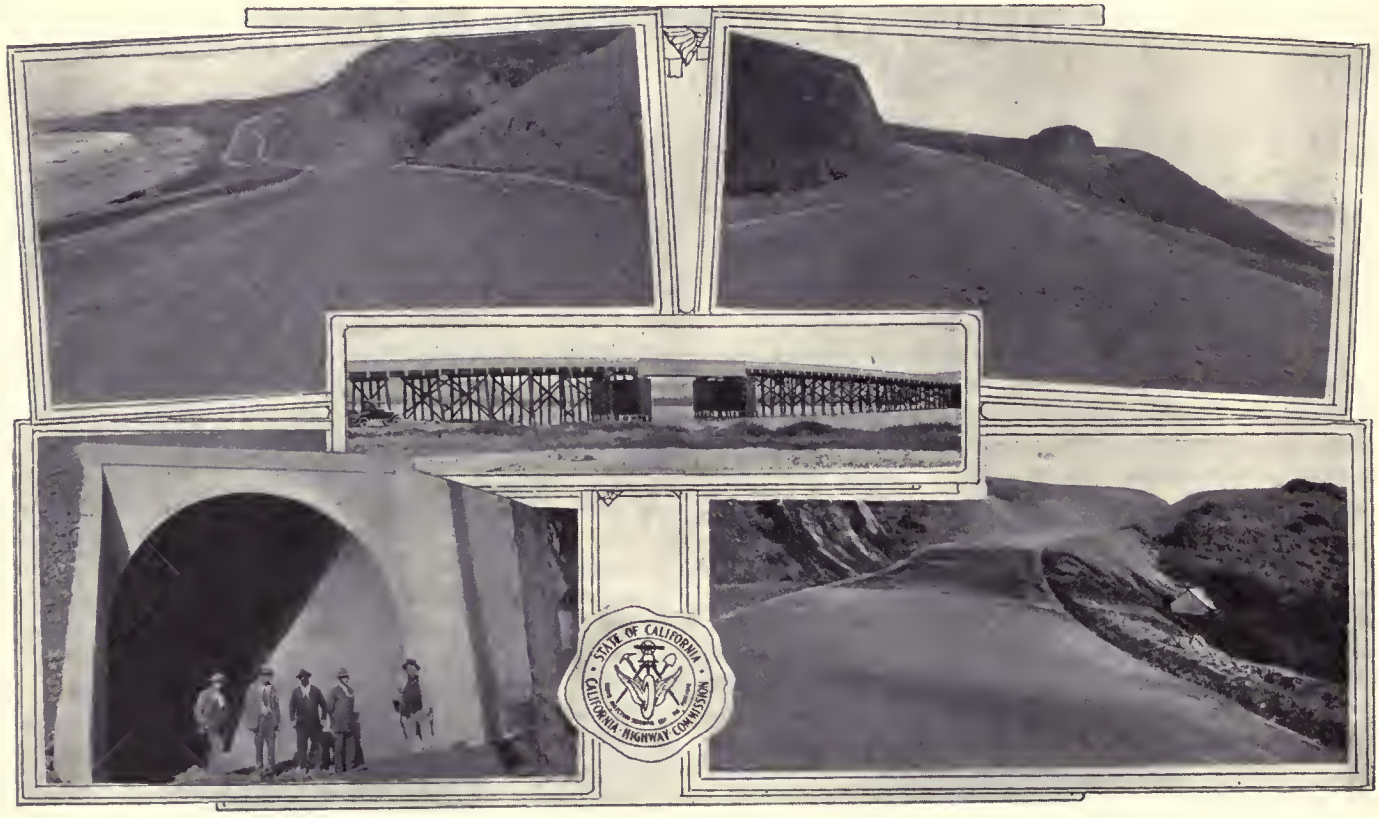
A provision also was added permitting the commission to turn over sections of state highway within their borders to municipalities, where the governing body desires and accepts jurisdiction. This should be a useful section as the commission is not organized for the purpose of constructing or maintaining streets within the larger cities, which have annexed highways or incorporated after the state highways were built. The control properly belongs with the municipality. Roads may be similarly relinquished to the counties.

Change of Routes.

Authority also is granted the commission to alter or change the route of any state highway and to abandon portions no longer needed when such abandonment is necessary or advisable. This will facilitate reconstruction of the state highways on higher standards of grade and alignment, a problem which is becoming more pressing as traffic increases. The commission also is given authority to maintain detour roads.

(Continued on page 4.)

ADDITIONAL GRADING FINISHED ON SOUTHERN COAST ROUTE



McCRAY CONTRACT, ORANGE COUNTY—Recently completed section of grading on the Oxnard-San Juan Capistrano highway between Corona Del Mar and Laguna Beach. *Upper views,* highway along ocean front; *center,* new bridge built by Orange County under state supervision over north arm of Newport Bay; *below,* special arch culvert; the wide grade. (Photos by Div. VII.)

CONSTRUCTION of the Oxnard-San Juan Capistrano coast highway is moving steadily forward. The commission has just accepted as completed the contract for grading 5.56 miles between Corona Del Mar and Laguna Beach, in Orange County. But one more section of twelve miles remains to be graded, that from Laguna to Serra, and the entire route will be broken through south of Long Beach.

Completion of the grading as far south as Laguna puts the latter beach in direct connection, via the coast, with Long Beach and the other beach cities of Los Angeles and Orange counties. Previous to the opening of this road, Laguna had but one outlet, the Orange County highway to Irvine. An attractive loop trip from Los Angeles to these beaches is now possible.

The new grade has been built on high standards of alignment. For a considerable portion of the distance, it has a width of forty feet and on the remainder a width of thirty feet. Several large reinforced concrete arch culverts are a feature of the project. All pipe culverts also are of reinforced concrete.

The work was done by W. D. McCray of Los Angeles. The allotment for the work, including the Boat Canyon extension at Laguna, was approximately $134,000. The work was financed with federal aid.

The new unit of the Coast highway opens to motorists a beautiful section of the Orange County coast which for years has been the delight of artists and sketchers of the sea.

C. N. Ainley was resident engineer. He was assisted by J. P. McAndrew and L. R. McNeely.

NEW LAW CHANGES POLICY

(Continued from page 3.)

Provisions regarding the authority of the commission to condemn property for highway purposes are extended and clarified. The commission may now acquire through such proceedings not only rights of way, but lands for offices, shops, storage yards, gravel pits, rock quarries, sand or earth borrow pits, lands adjoining the highway for parks, and lands and trees within three hundred feet of the highway for the purpose of protecting the roadbed or preservation of the attractiveness and beauty of the adjacent lands.

The commission also may acquire property to make possible an unobstructed view of the highway where the same is necessary to provide for the safety of traffic; it may acquire and maintain stock trails paralleling the highway and require that all untethered stock shall be driven over such trails.

Other Powers and Duties.

Among other powers and duties conferred upon the commission by the act are the following:

To make investigations and compile information concerning improved methods of highway building;

Assist counties, cities, boulevard and highway districts in making surveys, plans and specifications for the construction of highways and bridges, and, in its discretion, act as consulting engineer on such projects;

To obtain insurance for the protection of its members, engineers and employees while engaged in state work;

To have charge of all cooperative highway work engaged in by the state and the federal government.

Local Contractors to Have Chance.

Authority also is granted the commission to advertise for bids for work, the estimated cost of which does not exceed $15,000, the bids to be opened by the division engineer after notice for eight days in a paper within the county where the work is to be performed. At present such work has to be advertised for four weeks, and the bids opened by the state highway engineer. This prevents much small emergency work from being done under contract. The provision was inserted upon the recommendation of the state highway engineer and will give local contractors an opportunity to bid on work now performed largely by day labor.

At the suggestion of the Attorney General, the attorney for the commission has been authorized to approve contracts, relievlng the Attorney General's office of this duty. This will facilitate getting work under contract.

The act contains many other useful changes in highway procedure which will make it possible for the commission and the state highway engineer to more efficiently serve the public. All financial transactions of the department are subject to the supervision of the State Board of Control.

NEW HIGHWAYS ADDED TO SYSTEM

The Bay Shore highway was extended and seven new routes were added to the system by bills signed by Governor Richardson. They are as follows:

BAY SHORE HIGHWAY, SAN FRANCISCO TO SAN JOSE—41.5 miles (San Francisco, San Mateo and Santa Clara counties). The new law definitely places this route in the state highway system and changes its description from "the county line of the city and county of San Francisco to and through the county of San Mateo," as enacted in 1923, to "from San Francisco to the city of San Jose." It is urged as a new trunk line into San Francisco to relieve traffic congestion on the Peninsula highway.

POINT SAN QUENTIN TO SAN RAFAEL—3 miles (Marin County). This road is needed as new trunk line feeding into San Francisco from the Redwood highway. Its construction will aid in relieving congestion on the Marin side of the bay.

UKIAH TO TALMADGE—2 miles (Mendocino County). This road will connect a state hospital with the Redwood highway.

CRESCENT CITY TO THE OREGON LINE—19 miles (Del Norte County). This highway is needed to connect the California system with the trunk highway under construction down the coast by the state of Oregon, known in that state as the Roosevelt highway. It was already a part of the 7 per cent federal aid system of California.

ANGELS CAMP TO CALAVERAS BIG TREES—24 miles (Calaveras County). This addition will connect the Mother Lode highway with the Ebbitts Pass state road, by way of the Big Trees.

OXNARD TO EL RIO—2 miles (Ventura County). This road is an omission of the bond issue of 1919. It is needed to connect the coast state highway, ending at Oxnard, with the trunk highway extending from San Francisco to Los Angeles.

NEEDLES TO THE COLORADO RIVER OPPOSITE TOPOCK, ARIZONA—12 miles (San Bernardino County). This is another omission of the 1919 bond issue. The bridge across the Colorado River is at Topock, not Needles, and at the former point the California road connects with the Arizona state highway system.

BARSTOW TO THE NEVADA LINE NEAR JEAN—(Silver Lake Cut Off) 125 miles (San Bernardino County). This highway forms a part of a direct route between Los Angeles and Salt Lake City, generally designated the Arrowhead Trail. It is favored by the Bureau of Public Roads and the state of Nevada and will connect with an improved road in that state.

Total added to system approximately 230 miles.

FEDERAL-AID ROAD JOB ONE-THIRD THROUGH

GOVERNMENT HAS PLACED 54,954 MILES OF HIGHWAY UNDER CONSTRUCTION, TO COST $452,880,341

UNCLE SAM is helping build roads so fast that when he turned the corner into 1925 he had placed under construction nearly one-third of the total mileage of the main, interstate and intercounty system provided for in the Federal Highway Act approved in November, 1921. In brief, according to the report of the Bureau of Public Roads, he had placed 54,954 miles of federal-aid roads under construction up to January 1 last, which will cost him $452,880,341, while his contract with his peoples calls for 174,350 miles. In addition a very large mileage, probably in excess of the mileage proposed for improvement with federal aid, already has been improved by the states without federal assistance.

The total of all federal aid funds apportioned to the states up to the beginning of the year was $525,125,000, of which $469,-498,477 had been definitely allotted to particular projects totaling 57,073 miles. The 54,954 miles which had been placed under construction will receive federal aid in the amount of $452,880,341, and of this sum $380,528,813 had been paid up to January 1 for work completed on these projects.

Of the mileage which had been placed under construction up to the beginning of the current year a total of 42,828 miles had been completed, leaving a balance of 12,127 miles actually under construction at the beginning of the year. Work will be continued on this mileage during the year and it is anticipated that fully ten thousand miles will be completed before January 1, 1926.

The accompanying chart shows the mileage of the approved federal-aid system in each state and the portion which had been placed under construction with federal aid up to the beginning of the year.

The state with the largest approved mileage is Texas in which the system includes 10,930 miles, nearly five thousand miles of which already has been placed under construction with federal aid.—*American Motorist.*

OTHER HIGHWAY LEGISLATION.

Other highway legislation approved by the Governor which may be mentioned includes:

Senate Bill 604, authorizing the State Board of Control to sell to the highest bidder real estate under the jurisdiction of the commission and which is no longer needed for highway purposes.

Senate Bill 360, granting the commission a thirty-foot strip from the lands of the Whittier State School for the widening of the Whittier boulevard in Los Angeles County.

Assembly Bill 430, prohibiting cities from changing the grade of completed state highways which were constructed prior to the incorporation of the municipality or the annexation of the highway in question, unless consent of the highway commission for such change is first obtained.

The Governor also approved an appropriation of $150,000 for state aid in the construction of highways by joint county highway districts.

"By Ear."

"My dear young lady," said the clergyman in grieved tones, as he listened to the extremely modern young woman tear off some of the very latest jazz on the piano, "have you ever heard of the Ten Commandments?"

Modern Young Lady—"Whistle a few bars and I think I can follow you."

The other day a resident of Anderson, Shasta County, chipped a glittering object from the concrete pavement of the state highway to find that it was a gold nugget which assayed $2.30. The gravel used in the construction came from Clear Creek where much mining was done in the early days.

NEW HIGHWAY ELIMINATES DANGEROUS GRADE CROSSINGS

BARSTOW LINE CHANGE—Views of the recently completed section of the National Old Trails state highway at Barstow, San Bernardino County. *Upper left,* business buildings under construction on the route of the new highway; *upper right,* the new grade stretching away across the desert, eliminating the meanderings of the old road; *lower left,* near Barstow, the new grade, old county road at left; *lower right,* former crossing of the Santa Fe railroad yards, this and several other dangerous grade crossings have been eliminated by the new routing.

THREE more dangerous grade crossings have been removed from the California highway system—this time by an improvement on the National Old Trails route through the town of Barstow, San Bernardino County, 150 miles east of Los Angeles.

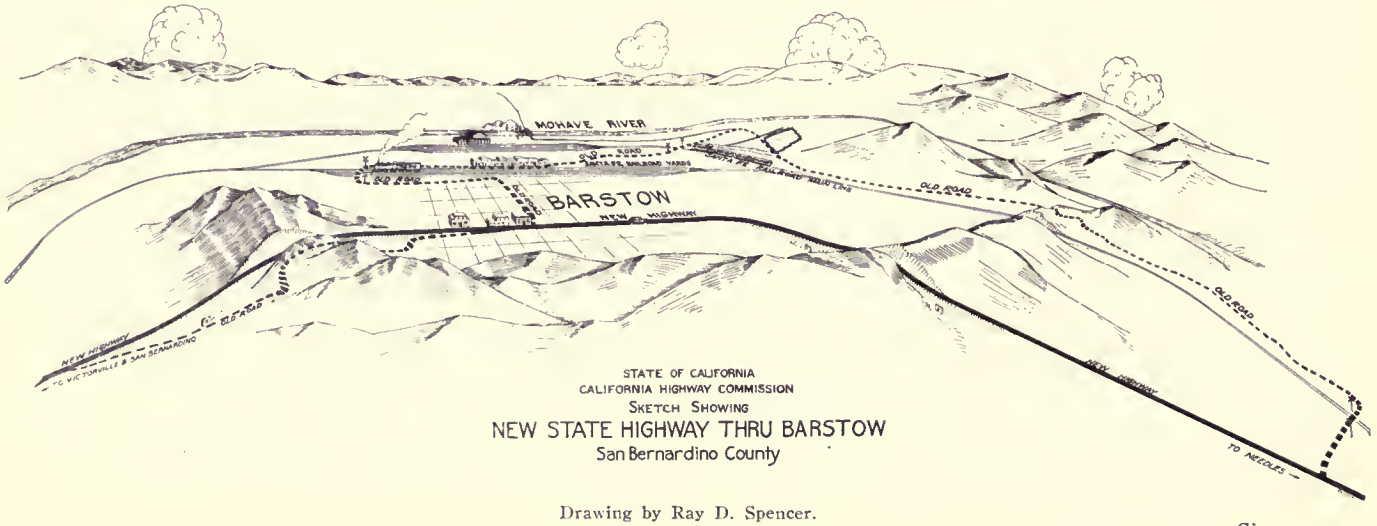
The old county road, shown in the illustration, followed a tortuous course through the town, crossing the main line of the Santa Fe railroad twice and passing through its freight yards. It had many right angle turns and the view at two of the crossings was obstructed. Accidents were frequent.

Grading of less than three miles of the state highway shortened the distance 1½ miles and eliminated the three railroad crossings.

Town Moves to New Road.

The business section of Barstow has always been located in a depression between the passenger and freight yards of the Santa Fe, a noisy and dusty location for a desert town. The influence of modern highways is well illustrated by the fact that, since the highway has been constructed on the new line away from the tracks, a large part of the business section is being moved to a new location along the state highway, where a number of substantial business buildings have been erected.

There is general rejoicing in Barstow over the fine appearance of the new structures and the sightly location of the new business district.



Drawing by Ray D. Spencer.

DETERMINING THE QUALITIES OF SHOULDER MATERIALS BY LABORATORY TESTS

UP TO THE present time no satisfactory test has been worked out to determine, before actual use, the qualities present in materials proposed for construction of highway shoulders. The qualities generally necessary are a good binder, resistance to wear, retention of moisture in dry climates, and freedom from excessive shrinkage. If previous to use materials proposed for shoulder work could be measured by these standards, so that definite knowledge might be substituted for the opinion of the engineer, saving of large sums in unavailing expenditures would be possible.

With this thought in mind the laboratory has been endeavoring to work out a test that will give the desired information. Six samples of proposed shoulder material, recently submitted by Acting Division Engineer E. Q. Sullivan of Division VIII, provided the opportunity for a series of experiments the results of which will be of interest to engineers throughout the department.

These samples consisted of disintegrated granite, quarry waste, and other materials from various sources along the highways of the division. Standard tests for determining hardness and toughness of stone could not be made on this material and, in any event, would not have been conclusive, it is pointed out by C. L. McKesson, research engineer.

Shoulders of the type proposed to be constructed will be exposed to use in regions of exceedingly light rainfall. Binding quality, therefore, is of the highest importance and probably more important than the wear resisting qualities of the particles.

How the Tests Were Made.

Reporting to Mr. Morton through the construction department, Mr. McKesson had the following to say regarding the results of these tests of shoulder material:

"This material received special consideration with the idea of attempting to work out new tests which will indicate binding qualities of material for shoulders and surfacing. The material as received was moistened and mixed preparatory to moulding in 6 x 6 x 12" prismatic moulds. The amount of water necessary to reach moisture equivalent stage in the material was noted. Some additional water was added until the material was wet enough to give about 2" slump. It was then tamped into the moulds and finished up exactly as with concrete specimens.

Considerable difficulty was experienced in getting the specimens dry enough to permit their removal from the moulds. By the use of electric fans and by covering the specimens with hot sand, they were hardened sufficiently for removal in about a week. They were then dried for four days in an air current and three days in a warm cabinet at 100° F. The specimens were then capped with plaster of paris and crushed in our testing machine. The compressive strength developed ranged from 620 pounds to 6430 pounds on the end of the 6 x 6" specimen.

Moisture equivalent determinations (Rose method) were made and shrinkage determinations. A complete mechanical analysis was also made of the material because it was realized that binding qualities alone were not sufficient. The mechanical analysis, moisture equivalent determination and shrinkage tests show the percentage of rocky material contained in the samples, percentage of clay and silt and probable stability of the material in the presence of varying amounts of moisture.

Tables Give Details of Tests.

Tables No. 1 and No. 2 following show in detail the results of these tests:

TABLE No. 1.

Sample No.	Description	Compressive strength, 6 x 6 x 12"	Per cent H_2O in specimen	Moisture equivalent, total	Moisture equivalent, Rose's method	Shrinkage volume, per cent	Shrinkage lin., per cent
1855	D. G. and caliche	620	19.0	14.9	12.2	8.19	2
1856	D. G. and red clay	6430	15.9	13.0	11.8	8.13	2
1852	Clay crusher waste	2270	16.7	12.4	10.7	6.12	2
1851	D. G. and red clay	3320	14.7	11.4	10.0	8.15	2
1853	Rock dust and No. 5	2350	14.3	10.3	9.0	5.11	1
1854	¾-inch rock and dust	1360	14.5	9.9	8.3	1.58	1

NOTE.—Samples arranged in order of relative moisture equivalent.
D. G. = Disintegrated Granite.

TABLE No. 2.

Screens	1851 Per cent passed	1852 Per cent passed	1853 Per cent passed	1854 Per cent passed	1855 Per cent passed	1856 Per cent passed
Total sample grams	9750	11,840	13,055	11,470	11,360	10,945
Wash	13.5	10.5	11.2	8.2	16.5	12.6
200	16.5	12.3	17.4	13.0	20.2	16.9
100	24.6	15.2	24.9	18.9	30.0	26.2
80	29.2	16.6	28.6	21.0	35.1	30.1
50	37.1	19.2	33.2	24.7	40.9	36.2
40	42.4	21.9	38.0	28.3	46.1	41.6
30	49.0	25.0	43.6	32.1	51.6	47.2
20	63.1	32.5	56.2	41.3	62.6	61.4
10	82.0	48.6	76.2	58.0	78.2	83.9
3	97.2	84.5	100.0	88.6	93.1	96.4
½-inch	99.2	98.6	----	99.3	97.6	98.4
¾-inch	100.0	100.0	----	100.0	100.0	99.1
1-inch	----	----	----	----	----	100.0

Relative Suitability.

The foregoing tests, together with examination of the rocky particles after washing, justify the following report on the materials in the order of relative suitability:

Sample 1856—

Red disintegrated granite.

Source: .4 miles north state highway on road to Amboy Station 150, VIII-Riv.-26-D.

Quantity: Unlimited.

This material consisted of disintegrated granite with 12.6 per cent of clay and silt lost in washing. Ninety-six per cent of the material passed No. 3 sieve. The disintegrated granite particles were reasonably hard and suggests that the material may be expected to wear well. The cementing value of this material was

(Continued on page 8.)

NEW DIVISION HEADQUARTERS AT REDDING COMPLETED

DIVISION II HEADQUARTERS—*Upper right,* the new division office at Redding, Shasta County, recently occupied by H. S. Comly and his staff; *upper left,* the accounting department; and, *below,* the large airy drafting room.

SHOULDER MATERIAL TESTED

(Continued from page 7.)

very high. The total load on 6 x 6 specimens was 6430 pounds or a compressive strength of 179 pounds per square inch.

Sample 1851—
Disintegrated granite.
Source: .2 miles north of Station 554, VIII-Riv.-26-D.
Quantity: Unlimited.

This material consisted of light colored disintegrated granite with 13½ per cent of clay and silt lost in washing. The grading of the material is almost identical with that of the preceding sample, but the particles are somewhat softer and the binding quality only about half that of the preceding sample. Probably make good shoulder material, but not equal in quality to No. 1856.

Sample 1852—
Clay crusher waste.
Source: Blue Diamond Rock Company, Corona Plant.
Quantity: 50-ton lot.

This material is somewhat coarser than the two preceding samples and contained only 10½ per cent of clay and silt lost in washing. The rock particles are extremely hard and would wear well under traffic. The specimen took a total load of 2270 pounds (63 pounds per square inch) which, while considerably less than the disintegrated granite specimens, nevertheless indicates good binding quality. It is believed that this material would make satisfactory shoulders.

Sample 1853—
No. 5 crushed rock.
Source: Orange County Rock and Gravel Company, Frink Plant.
Quantity: 25 tons.

This material is considerably finer than any of the preceding samples, 100 per cent passing No. 3 and 76 per cent passing 10 mesh. The sample contained 11.2 per cent clay and silt removed in washing. The rock particles were sound and cementing quality quite satisfactory. The total compressive load was 2350 pounds (65 pounds per square inch).

Sample 1854—
¾" rock and dust mixture.
Source: Orange County Rock and Gravel Company, Frink Plant.
Quantity: 25 tons.

This material is somewhat finer than sample No. 1853 and contained only 8.2 per cent clay and silt. The stone particles were sound but binding quality was rather low. The total load was 1360 pounds (38 pounds per square inch). This material would apparently be much less suitable for shoulder work than any of the preceding samples.

Sample 1855—
Disintegrated granite and caliche.
Source: Right of Way Station 400, Riverside-26-D.
Quantity: Unlimited.

In grading, this material quite closely resembles the disintegrated granite samples, but contained 16½ per cent of fine material lost in washing. The stone particles were rather soft and cementing value very low. The total load on this specimen was only 620 pounds. The material might be expected to make loose dusty shoulders which would not be adapted for use in a dry, hot climate.

Standard Methods Seem Possible.

The results obtained in the experiments above described indicate there is a possibility of working up standard methods of testing which will indicate the binding quality of material. This, taken in conjunction with hardness and toughness tests and the character of the binding material as indicated by moisture equivalent and shrinkage tests, should enable us to anticipate the probable road-making qualities without waiting for a service test on the road."

Standard Specifications for Future Construction

By L. V. Campbell, Office Engineer.

STANDARD specifications which will govern future state highway construction have been approved by the State Highway Engineer and will be ready for distribution to contractors by the time this is in print. A single volume will contain the specifications for various items ordinarily employed in the construction of both roads and bridges.

The plan, which is being adopted by California for the first time, has been successfully followed for a considerable period by a number of the states and the United States Bureau of Public Roads.

As soon as the standard specifications are available, the practice which has prevailed heretofore of printing separate specifications for each project on which bids are asked will be discontinued. In the future only special provisions, proposal, and contract forms will be printed for individual contracts.

Special Provisions to Cover Modifications.

The standard specifications, in so far as they apply, will govern all future construction and necessary modifications or additions for any particular job will be included in the special provisions.

As soon as ready for distribution, a copy of the new standard specifications will be sent each contractor whose name is on the department's mailing list; a supply also will be furnished the division offices. When work is advertised for bids, the special provisions, proposal, and contract forms will be distributed in the manner which now prevails in the distribution of specifications. Prospective bidders will be furnished with the special provisions, and these, together with the standard specifications previously supplied, will constitute the specifications for particular jobs.

After a contractor has once been furnished the standard specifications, additional copies will be sent him only upon specific request.

Changes May Be Quickly Grasped.

California highway specifications have been undergoing a process of evolution with the result that hardly two succeeding sets have been issued without changes of more or less importance. The convenience of the new specifications will be readily appreciated by the engineers and contractors alike when they become accustomed to their use. In the future they need not be constantly on the alert for minor changes affecting the cost or manner of doing the work, as all such modifications will be contained in a few paragraphs in the special provisions.

The standard specifications represent present practices as demonstrated in some of the latest 1925 projects. The individuality of each job, which is the result of careful planning and thorough study, will be reflected in the special provisions under the new plan.

Recent Changes in Specifications.

Some of the changes which have been made recently and which are retained in the new standard specifications are as follows:

Grading provides that refuse from clearing be burned; that existing drainage ditches be cleared of weeds, brush, etc.; and that on repaving jobs, grading for changes in alignment be carried on sufficiently in advance of paving operations to permit thorough compacting of new fills.

Crushed gravel or stone surface provides for a maximum one-inch-sized material in both base and wearing course. The provision for compacting by hauling over the surfacing already placed, and by dragging, is retained. Thickness designated for a rock surface is the loose thickness as the material is spread.

The specifications for bridges, culverts, and other structures have been combined into two sections, covering Portland cement concrete structures and foundations for structures. The appropriate clause of these sections will apply to either bridge or culvert construction.

A section for a waterbound macadam base has been included. Bituminous macadam specifications have been rewritten to provide for three types of bituminous macadam surface.

A section for asphaltic road oil has been included.

The asphalt concrete specifications permit the use of collector dust in the base course. There are three types of asphalt concrete surfacing, one using 1¾-inch maximum aggregate, one using ¾-inch maximum, and a modified Topeka mix.

To the present four classes of Portland cement concrete, has been added a fifth class of quick hardening concrete designated Class "D" concrete, for use in patching base or shoulder construction when an asphalt surface is being laid.

Paving Requirements.

Except for Class "A" concrete in structures, three sizes of aggregates are required in proportioning. The paving specifications prohibit the dumping of aggregates on the subgrade or shoulders. This would require the use of a central proportioning plant and the hauling of the dry batches to a mixer on the grade; or a central mixing plant and the hauling of the wet mixed concrete to the grade. This is not a recent provision but it seems to have been overlooked on occasions. The use of a roller in finishing pavement is no longer required.

The gauge of metal for corrugated metal pipe has been increased in some of the sizes, otherwise the specifications remain unchanged.

A requirement for minimum strength of light reinforced concrete pipe has been included in the specifications for that material.

SERVICE TO THE PUBLIC BY DIVISION III CREW IS APPRECIATED

CREWS of the California Highway Commission are employees of the public, and, as such, it is their desire at all times to faithfully serve the users of the highways. A spirit of service pervades the entire organization and motorists should have no hesitancy in asking aid of maintenance forces when help is needed.

That assistance to those needing aid is fully appreciated, is evidenced by the following letter received by Division III from a San Francisco man, whose machine left the grade above Auburn during a recent rain:

STEPHEN SMITH & COMPANY
639 Mission Street
San Francisco

June 5, 1925.

California State Highway Department,
Sacramento, California.

Atten: Mr. T. H. Dennis, Ass't Div. Engr.

Dear Mr. Dennis: On May 31st you passed through Alta in your car. You saw my Nash car over the grade and gave permission to your men to utilize the state trucks in pulling it out.

I want to thank you and Mr. W. M. Barnes and Mr. Joe Nelson. These latter two gentlemen showed very great interest in getting the car out, and did everything in their power to help us get out of the mountains.

I wish to congratulate you on having two such men in your organization, for they surely are conscientious workers and are thinking of the state's interest at all times.

Yours truly,
STEPHEN SMITH & COMPANY,
(Signed) Stephen Smith, President.

KERN RIVER CONVICT CAMP—Home of 200 prisoners from Folsom State Prison engaged in the building of the state highway through the Kern River Canyon, east of Bakersfield on the Walker Pass highway. (Div. V.)

TO FINISH KERN CANYON PROJECT IN DECEMBER

THE KERN RIVER Canyon project, 8.7 miles of grading and surfacing, under construction with convict labor, will be completed in December of this year. This is the prediction of Division Engineer J. B. Woodson of Fresno, after a study of progress since July, 1924, when the Folsom prison camp was moved from the Trinity lateral to Kern County.

Completion of this section of the Walker Pass route will provide the people of Bakersfield and Kern County with a high standard highway through the Kern River Gorge as far east as Democrat Springs, where the highway emerges from the canyon into the upper Kern River Valley, in which is located the towns of Bodfish, Isabella, Weldon, Kernville, and Onyx.

From this point eastward, there is a travelable county road across the Sierra Nevada Mountains via the Walker Pass to Freeman. At this point, it intersects the route of the trunk line state highway east of the Sierra.

First Section Was Contract Job.

Previous to the establishment of the convict camp, 6.8 miles of this route was graded and surfaced under contract at a cost of $434,914.73. This work extends from a point about ten miles east of Bakersfield to Rich Bar, in the canyon of the Kern. Between Bakersfield and the beginning of the W. S. Mead contract, no work has been done except the building of a reinforced concrete bridge across Cottonwood Creek, now under construction with funds supplied by Kern County.

The prison camp was established some distance above Rich Bar. At the present time, about 210 convicts and 40 free men are engaged in the work. In the opinion of the engineers excellent progress has been made, considering the many difficulties encountered. The excavation for the grade in many places is through almost solid rock where the use of a large amount of explosives is necessary. These have been secured largely from excess war supplies and consists of T. N. T., Sodatol, Pyrotol, all having approximate strength of 40 per cent dynamite.

End of Project in Sight.

Up to the present time, three miles of highway have been completed and surfaced to a width of 22 feet, and on two additional miles rough grading has been finished. Due to the large amount of rock to be moved, costs are averaging about $1.20 per cubic yard, or $60,000 per mile. This, however, includes the cost of all structures and the placing of six inches of decomposed granite surfacing.

For the last two and a half miles of the project, the highway passes through an earth formation where it is expected grading costs will drop to $30,000 a mile. The allotment for the entire project of 8.7 miles was $500,000. Division Engineer Woodson expects a considerable portion of this amount will remain unexpended when the work is completed.

Two steam shovels are being used in connection with grading operations. The shovels are manned with free labor as required by law; truck drivers and structural workers also are free men.

Highway Added by 1919 Bond Issue.

The new highway, a route added to the state system by the 1919 bond issue, will shorten the mileage and greatly decrease the grades of the trans-Sierra road between Bakersfield and the Trunk Line highway between Los Angeles and the Owens Valley. It will provide the lower San Joaquin Valley with an outlet into the higher elevations of the mountains, and it is probable that this was one of the objects its promoters had in mind when it was urged as a state highway.

As opportunity offers, Superintendent Ralph W. Brown has continued, at the new camp, his policy of promoting interest among the prisoners in outdoor recreational activities. The camp baseball team plays games with organizations from Bakersfield and other nearby communities. A radio and motion pictures provide entertainment at frequent intervals and a well supplied library, largely the work of the Sacramento County librarian, furnishes books and magazines.

The Kern River camp is the first prison road camp to be established in the southern part of the state. As such camps are a success only in the remoter mountain sections, where there is much hand labor to be performed in the construction of the state highways, most of the road projects on which prison labor could be used to an advantage have been in the northern counties.

C. M. Rosenberg was resident engineer at the inception of the project but has been compelled to take a leave of absence because of ill health. T. W. Voss is now resident engineer.

PEST ERADICATION APPRECIATED BY ORANGE COMMISSIONER

MAINTENANCE forces of the California Highway Commission have problems to solve other than strictly highway work. Not the least of these is the control of roadside growths and the spread of various pests, which may be capable of great damage to adjoining property.

The work of the maintenance forces of Division VII, in their efforts to assist in the spread of Johnson grass in Orange County, is appreciated by the Horticultural Commissioner of that County, as evidenced by the following letter received by Division Engineer S. V. Cortelyou:

Office of
COUNTY HORTICULTURAL COMMISSIONER
Room 319
HALL OF RECORDS
Santa Ana, California

A. A. BROCK, Commissioner
CHAS. F. COLLINS, Deputy Commissioner

May 11, 1925.

MR. S. V. CORTELYOU,
Division Engineer, California Highway Commission,
Pacific Finance Bldg., Los Angeles, California.

DEAR SIR: This is to acknowledge receipt of yours of the 8th inst. and thank you for the splendid spirit of cooperation expressed therein.

We feel sure that it is only a matter of good business to eradicate this small patch of Johnson Grass before it becomes spread over a large area which means more expense for eradication.

Could we receive such cooperation from all with whom we deal as we get from your department, our work would indeed be easy.

Again thanking you, I am,

Very truly yours,

(Signed) CHAS. P. COLLINS,
Deputy Commissioner.

Liberal quantities of crude salt were used in the extermination work discussed in the above letter.

DIVISION III FOREMEN INSPECT EACH OTHER'S SECTIONS

UNDER the direction of Assistant Division Engineer T. H. Dennis, maintenance foremen of Division III, stationed in the Sacramento Valley, were taken on an inspection trip over each other's sections on May 26th and 27th.

The four foremen from the west side of the valley assembled in Sacramento, May 26th, and were taken on a trip over the highway on the east side. On the following day, the four east side foremen were taken on a trip over the west side state highway, each man having an opportunity to study the methods of other maintenance foremen in the valley.

The friendly exchange of views and discussions of mutual problems, which took place, should result in benefit to the work. The foremen participating in the inspection were:

F. R. Garrison, Willows; William Hampton, Arbuckle; B. D. Gipner, Woodland; P. Forrest, Williams; A. D. Kipp, Chico; J. E. Stevens, Wheatland; L. A. Vance, Gridley; S. A. Martindale, Roseville.

MAINTENANCE PROBLEMS DISCUSSED

MAINTENANCE problems from the viewpoint of the man in the field were discussed by the maintenance foremen of Division X, who were called into conference in Sacramento on May 16th by Division Engineer J. C. McLeod. After a short talk by Mr. McLeod, Assistant Division Engineer R. E. Pierce, who is in charge of maintenance in the division, led the discussion.

Misunderstandings regarding letters of instruction, methods of accounting for equipment, and rental of equipment, were among the subjects gone into in detail during the discussions. Short talks were made by Assistant State Highway Engineer T. E. Stanton; Assistant Highway Engineer G. R. Winslow, in charge of maintenance for the entire state; and W. F. Mixon, secretary of the commission.

That much good was accomplished by the interchange of views between the field men and the division headquarters staff was the opinion of those in attendance, who were:

J. C. McLeod, W. K. Wright, R. E. Pierce, L. E. McDougal, R. A. Watkins, E. W. Zumwalt, C. J Temby, A. M. Nash, division headquarters, Sacramento; and foremen J W. Bertram, Ione; B. W. Bicksler, Sacramento; C. Bevey, Stockton; R. Brennan, San Andreas; J. H. Gates, Fairfield; S. W. Harris, Jamestown; W. P. Hodgson, Davis; L. P. Laird, Modesto; G. E. Marshall, Rio Vista; W. H. Martin, Groveland; G. P. Merrill, Woodfords; and F. M. Walker, Pine Grove.

STOCKTON COMMITTEE HEAD PRAISES MAINTENANCE WORK

THE Stockton Chamber of Commerce is thoroughly convinced of the efficiency of the maintenance work of the California Highway Commission, especially that which is being done on the mountain laterals leading to Yosemite National Park. The Stockton Chamber recently conducted its annual sociability run into the park over the Big Oak Flat road, which is in charge of Superintendent W. H. Martin of Groveland.

When he returned home, G. E. Reynolds, chairman of the committee in charge, addressed the following letter to Superintendent Martin:

STOCKTON, CALIFORNIA, May 26, 1925.

MR. W. H. MARTIN,
Superintendent Big Oak Flat Road,
Groveland, California.

MY DEAR MR. MARTIN: Now that the San Joaquin County Sociability run to Yosemite Valley is over, on behalf of the Out Door Committee of the Stockton Chamber of Commerce and the various participants in the tour, I want to thank you and your coworkers for the splendid cooperation given us. We were quite prepared, through the warnings given us, to encounter bad roads and were most agreeably surprised to find them so much better than we expected. The condition of the highway showed the results of your heroic efforts to put the road in shape for us. On all sides we heard nothing but praise for the splendid work of the State Highway Maintenance Department.

We were sorry to impose on your forces as we did, but under the circumstances we felt a postponement out of the question. We had 191 people signed up for the tour on the day that you phoned. We would have lost more than half of these by postponing until this week end and a two-weeks postponement would have conflicted with the date of the visit of the Congressional Appropriations Committee which is scheduled to go over the Big Oak Flat road on the morning of June 8th. Three weeks' delay would have thrown us into the middle of June. Our people wanted to see the Valley in May with the waterfalls at their height.

Our party was a splendid success from every standpoint and was without a single mishap or untoward circumstance. Please convey to your men an expression of our appreciation of their hard work. We are proud of the Big Oak Flat road and we are loyal boosters for the State Highway Maintenance Department. I had hoped to see you on the road as we went up but missed you. If you are ever in Stockton, drop in at the Record Office and give me a call.

Again thanking you and with kindest wishes, I am,

Very sincerely yours,

(Signed) G. E. REYNOLDS,
Chairman Out Door Committee,
Stockton Chamber of Commerce.

WHAT THE DIVISIONS ARE DOING

FORTY-FIVE MILES OF SURFACED HIGHWAY REPAIRED IN DIVISION I

MAINTENANCE forces of Division I have been busy during the past month placing gravel and crushed rock on approximately forty-five miles of highway in the division in anticipation of heavy summer traffic. This work is imperative due to the damage done by the unusually heavy rains of the past winter.

Use of light oil as a dust preventive will be tried in Division I during the summer. If the experiment proves successful and economical, the work will be expended if funds are available.

CALCIUM CHLORIDE TO BETTER CONDITIONS ON PACIFIC HIGHWAY

DIVISION II is completing the application of calcium chloride on all unpaved sections of the Pacific highway in Siskiyou County and on the recently widened section between Bayha and Half Way Creek, in Shasta County. The use of chloride, together with the late rains, is expected to eliminate much of the dust nuisance on this heavily traveled route during the summer months.

Late rains and high water delayed construction of a temporary bridge across Trinity River at Cedar Flat, on the Trinity River highway, where traffic was cut off by a washout last winter. This route is now open to traffic and in good condition. Grading in the vicinity of Weaverville has been completed.

Normal progress is being made by the Nevada Contracting Company on the big grading contract between Half Way Creek and Dog Creek, on the Pacific Highway, Shasta County. This section is now open to traffic from 7 a.m. to 10 p.m. daily.

Landscaping of the new division office grounds at Redding has been completed and they now present an improved appearance.

COLFAX-GOLD RUN GRADING TO BE COMPLETED AHEAD OF SCHEDULE

RAPID progress is being made by C. R. Adams, contractor on the grading contract covering the Colfax-Gold Run section of eight miles, in Placer County. Six miles of heavy grading has been finished to date and completion of the work ahead of schedule, probably by October, 1925, is predicted by Division III engineers.

Work is starting on the Camino-Sportsman's Hall grading project in El Dorado County, recently awarded to Irey and Holden. Completion of the work by next fall is expected.

Surveys and plans have been authorized for the extension of the state highway through the town of Truckee. Surveys also have been ordered of sites for bridges across Walker Creek, Glenn County, on the Willows-Oroville lateral; and for a new bridge across Auburn Ravine, at the southern limits of Lincoln, Placer County. Glenn County and the Town of Lincoln will participate in the cost of these bridges. Plans will be made by the headquarters bridge department.

Improvements at Lake Tahoe.

On the north shore of Lake Tahoe, a crew has resumed grading operations preparatory to surfacing work, bids for which recently were received by the commission.

Revised plans have been completed for a thirty-foot concrete pavement between the American River bridge and North Sacramento, to be built in conjunction with the underpasses under the two railroads at this point, already under contract.

Considerable slide removal work has been done on the roads about Lake Tahoe and on the recently completed grade between Truckee and Boca, in the Truckee River Canyon. Widening operations on the highway between Emerald Bay and Meeks Bay, Lake Tahoe, have been resumed, an allotment of $10,000 from maintenance funds having been made for this purpose.

A sharp curve at Browns Corners, Yolo County, on the west-side trunk highway, has been improved by widening the pavement. Oil macadam shoulders are being placed on the state highway through North Sacramento.

Maintenance Material Stock Piled.

Division III recently completed the stock piling of 6000 tons of crushed rock on Sacramento Valley routes for patching pavement and other maintenance work. Superintendent W. H. Miller and a crew of seven men had charge. The unloading equipment consisted of an "A" frame and steel apron, a ⅜-inch cable and slip scraper, single drum hoist operated by a F-M type Z gas engine, fastened as a unit on skids and mounted on a trailer. The hauling was done by three five-ton trucks with hydraulic end dumps. From 150 to 200 tons was handled per day at a cost of 68 cents per ton. The average haul was two miles.

BAY SHORE HIGHWAY PROGRESS SPEEDED UP BY CONTRACTOR

CONSTRUCTION of the initial unit of the Bay Shore highway, from South San Francisco to Broadway Station, San Mateo County, is now progressing more rapidly than at any time since the inception of the work, it is reported by Division IV. D. A. Foley, contractor, has installed a new 1¾-yard steam shovel which is doing excellent work. The earth moving equipment on the job consists of four gasoline locomotives and thirty-six four-yard dump cars operating over an industrial railroad.

The resident engineer reports a recent day's run of 732 cars, working two shifts of eight hours each. Two power shovels and a drag line excavator are among the major equipment on the project.

Two power shovels are working on the J. P. Holland contract on the Skyline boulevard but late spring rains have delayed resumption of operations on the scale of last summer. Three miles of grading remains to be done immediately north of the junction of the La Honda road.

Widening Contracts Under Way.

The widening contract between San Pablo and El Ciervo, Contra Costa County, is well under way. The Kaiser Paving Company has sublet the grading to Blumenkranz and Vernon, who are at work on heavy grading near Tank Farm hill. Placing of asphalt macadam shoulders to increase the width of the pavement to thirty feet will complete the project.

Preliminary work on the widening project on the Peninsula highway, between Cypress Lawn cemetery and San Bruno, has been started by the Federal Paving Company, contractors. Culverts are being widened and an asphalt concrete mixing plant is being set up at Baden station. The Spring Valley Water Company is lowering its 54-inch water main which parallels the easterly side of the pavement from San Bruno to Baden.

Oiling Starts on Surfaced Roads.

Maintenance forces of Division IV are busy placing road oil, as a dust palliative, on many miles of crushed rock and gravel surfaced highways throughout the division. Work accomplished on the Pacheco Pass highway is reported satisfactory. The work is

VOLCANIC CINDERS—The state highway near Independence, Inyo County, surfaced with crushed volcanic cinders. (Division IX.)

now progressing on the Skyline boulevard south of San Francisco where more than ten miles have been spread with oil. The Black Point cut-off and the Beltane-Schellville highways, on the north side of the bay, will be similarly treated.

KERN COUNTY GRADING SECTION OF WALKER PASS STATE LATERAL

THE board of supervisors of Kern County on several occasions has extended liberal cooperation in the construction of state highway laterals in that county. The most recent instance is the grading of three miles of the Walker Pass lateral, east of the city of Bakersfield, connecting with the new Cottonwood Creek bridge and the state construction in the Kern River Canyon.

An offer also has been made to grade a section of the Mojave-Barstow state highway, if a definite location survey is made by the state. The matter is now under consideration.

Maintenance Station Planned.

The commission recently completed the purchase of an acre of land near Lemoore on the Coalinga lateral, where Division VI contemplates the location of a maintenance station.

Division VI has three reconstruction contracts under way on the main trunk line through the valley in Merced, Fresno and Kern counties, where widening and thickening of the old pavement is being done.

An allotment of $9,145 has been made for the relocation of a section of the Yosemite lateral in Mariposa County. This is probably the beginning of an extensive widening and straightening of the old grade, which, as originally constructed, is not up to the standards of the new work beyond the town of Mariposa and in the Merced River canyon.

TRAFFIC ON BEACH HIGHWAY IS AIDED BY OIL CAKE SHOULDERS

DIVISION VII has completed the placing of oil cake shoulders on the Coast boulevard from Huntington Beach southerly to the vicinity of Newport. The material was secured from the city of Huntington Beach, where an extensive street paving program is under way. Shoulders were placed at either side of the twenty-foot concrete pavement by removing the sand to a depth of seven inches for a distance of eight feet. After spreading, the oil cake was disked, sprinkled, shaped and rolled into a hard, smooth shoulder. It is wide enough for cars to park entirely off the pavement.

Providing a safe parking place will aid traffic and greatly add to the pleasure of motoring along the ocean front. Assistant Superintendent A. W. Schmuck had charge of the work.

Line Change Under Contract.

Another slide has prevented the final completion of the Hauser contract on the Ventura County coast. Some 10,000 yards of earth recently slid onto the grade near La Jolla Creek. The big slide at Big Sycamore Canyon has been cleared. South of the Hauser contract, grading is being pushed with vigor on the coast route through the Malibu Ranch.

The much discussed San Onofre-San Mateo Creek line change, in northern San Diego County, is at last under contract, including the grading and paving and construction of two new bridges. The new line will shorten the distance nearly a mile, eliminating sixteen curves.

DIVISION X RECONSTRUCTION IS PROGRESSING RAPIDLY

RAPID progress is being made by J. F. Knapp, contractor, on repaving work between Turner Station and the Stanislaus River, San Joaquin County, reports Division X. The fifteen-foot pavement between Manteca and Calla already has been widened to twenty feet with flush concrete shoulders. Grading is well under way on other portions of the project.

Superelevating of curves on the highway between Davis and Dixon, which was done in connection with the widening contract now under way in Yolo County, has greatly improved traffic conditions. The Kaiser Paving Company will complete the placing of flush concrete shoulders in the near future. F. C. Hewitt is now resident engineer in charge.

Resurfacing Appreciated.

Between Putah Creek and the Winters Wye surfacing of the original concrete pavement with asphalt concrete has been completed and the work is greatly appreciated by users of the highway.

Maintenance funds have been allotted for repairs to the east trestle approach of the New Hope Landing bridge between Walnut Grove and Thornton, San Joaquin County.

BRIDGE DEPARTMENT NEWS

THE AMOUNT of bridge work under way throughout the state is increasing. Contracts for several important structures were awarded during the month and bids are pending on four more which, in all probability, will be under contract by the time this bulletin is out.

Beauty, as well as utility of design, have been considered in the preparation of plans for the five structures in the Truckee River Canyon, which will be the main entrance to the northern part of the state.

Construction has been finished on the bridge over the north arm of Newport Bay, which was built by Orange County under state supervision. J. B. Hodges represented the bridge department.

The sidewalk on the Rio Honda bridge in Los Angeles County has been completed. The plans were the work of the bridge department.

Southern Bridges Under Way.

Construction has been commenced on three new bridges in southern California, over the San Gabriel River on the Whittier boulevard; over San Onofre Creek in San Diego County; and the Ventura bridge extension, Ventura County. J. B. Hodges, G. W. Thompson, and C. W. Jones, respectively, have been assigned to these projects as resident engineers.

Painting of four steel bridges between Saugus and the foot of the Ridge route is now under way under the supervision of the bridge department.

E. J. Murray has been assigned to the North Sacramento undergrade crossings as resident engineer.

J. P. Winslow will be assistant resident engineer in charge of the painting of five bridges on the Redwood highway in Humboldt County. The work is under contract.

W. P. Wesch, recently with the Montana Highway Commission, and M. L. Hydle of Division VII are new engineers added to the staff of the bridge department.

News has reached headquarters of the recent marriage of V. A. Endersby and Miss Frances Helen Holman of Berkeley.

New Civil Service Rules.

The State Civil Service Commission recently issued a new set of requirements and qualifications for positions in the bridge department. Engineers having a structural engineer's or structural draftsman's rating will be reclassified as "inside" or office men and "outside" or construction men, as follows:

Office:

Junior Designing Engineer—Bridges—Grade III.
Assistant Designing Engineer—Bridges—Grade IV.

Field:

Junior Construction Engineer—Bridges—Grade III.
Assistant Construction Engineer—Bridges—Grade IV.
Superintendent of Construction—Bridges.

PRAISES CALIFORNIA HIGHWAYS

"I came to spend several weeks and stayed two months."

This was the answer of C. J. McKenzie, highway engineer of New Zealand and a member of the Public Works Department of that country, when asked his opinion of California state highways following the completion of his recent investigation.

Mr. McKenzie is on a tour of the United States and Great Britain, inspecting highway construction for New Zealand where an extensive highway building program is contemplated. He had planned a comparatively short stay in California, but found so much of interest that he remained more than his allotted time.

Mr. McKenbie visited all parts of the state, investigating every phase of the department's activities, discussed construction methods with the engineers, and went away with the highest praises for California's highways.

Traffic made the demand, economics has shown that the demand was warranted, a splendid construction system has been the outcome and good roads are the result.

STATE HIGHWAY FUND CONTRACTS (Bond Funds, Including Federal Aid)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE MAY 4, 1925						
449	VII	Orange	60	B	Corona Del Mar to Boat Canyon	5.56	Grading	W. D. McCray	$150,834 37	Aug. 22, 1924	150
					AWARDED SINCE MAY 4, 1925.						
467	VII	San Diego	2	D	San Mateo Creek		Bridge	R. A. Wattson	$84,135 38	June 3, 1925	200
468	III	Nevada	38	B	Truckee River near Hinton		Bridge	McKay Engineering Co.	37,902 15	June 3, 1925	150
					Sub-total				$122,037 53		
					PENDING AWARD.						
	VIII	Riverside	26	E	Coachella Storm Water Drain		R.C. Girder Bridge		$37,069 43		
	II	Tehama	7	A	Through Corning	1.0	P.C. Concrete Pavement		41,537 48		
	III	Nevada	38	A	Across Truckee River at Prosser Creek		R.C. Girder Bridge		25,981 88		
	III	Nevada	38	A	Across Truckee River near Boca		R.C. Bridge		33,964 88		
	III	Nevada	38	B	Across Southern Pacific Railroad at Hinton		R.C. Girder Bridge		21,178 12		
					Sub-total	1.0			$159,731 79		
					Total State Highway Fund Jobs Awarded and Pending Award	1.0			$281,769 32		

NOTE—Primary construction covered by the above contracts does not include funds obligated on cooperative forest highway projects, prison road camp activities, or day labor jobs not being done under contract.

MOTOR VEHICLE FUND CONTRACTS (Including Gasoline Tax Fund)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE MAY 4, 1925						
M-58	VII	Los Angeles	2	D	Rio Honda Bridge		Sidewalk	K. O. Wetzel Co.	$3,722 06	Jan. 3, 1925	8100
					AWARDED SINCE MAY 4, 1925.						
M-79	VII	Ventura	2	D	Ventura River Bridge		Extension	Otto Parlier	$22,497 19	May 20, 1925	125
M-80	I	Humboldt	1	C-E-G	Various		Painting Five Bridges	R. Zelinsky	56,952 00	May 20, 1925	150
M-81	III	El Dorado	11	E-F	Camino to 2 miles east Sportsman's Hall	5.8	Grade and Gravel	Irey and Holden	51,464 34	May 20, 1925	180
M-82	VI	Kern	4	D	Beardsley Canal to Lerdo	8.2	Shoulders and Surface	Federal Paving Co.	155,006 30	May 20, 1925	150
M-83	VII	San Diego	2	D	San Onofre to westerly boundary	3.65	P.C. Concrete Pavement	R. A. Wattson	134,223 88	June 3, 1925	125
M-84	VIII	San Bernardino	26	A	Santa Ana River to Redlands	5.49	P.C. Concrete Pavement	Basich Bros. Co.	140,197 16	June 3, 1925	150
M-85	VII	Los Angeles	2	D	Montebello to Whittier	3.32	P.C. Concrete Pavement	Kuhn Bros.	138,050 46	June 3, 1925	150
					Sub-total	26.46			$698,391 33		
					PENDING AWARD.						
	V	Monterey	2	H-I	1 mile north of Bradley to San Ardo	12.1	Macadam Shoulders		$39,600 00		
	V	Monterey	2	G	San Ardo to San Lucas	11.0	Macadam Shoulders		34,880 63		
	III	Placer	39	A	Tahoe City to Nevada State Line	11.6	Gravel Surface		26,901 00		
	IV	Sonora	1	B	Healdsburg to Mark West Creek	8.79	Concrete Pavement		313,630 20		
	VI	Merced	32	C	6 miles east of Los Banos to San Joaquin River	10.0	Stone Shoulders		26,289 00		
					Sub-total	53.49			$441,300 83		
					Total Motor Vehicle Fund Jobs Awarded and Pending Award	79.95			$1,139,692 16		

NOTE—The above obligations charged against the Motor Vehicle and Gasoline Tax Funds do not include funds from these sources obligated for general maintenance and for specific betterments not being done under contract.

HIGHWAY NEWS NOTES

Lund Succeeds Grant.

ALEX LUND, formerly assistant superintendent at Briceburg, has assumed the superintendency of the Smith River convict camp in Del Norte County, succeeding George D. Grant, resigned.

H. T. Heaton, resident engineer in Division II, has resigned to accept a position with an irrigation district.

Division III News.

H. R. Church has been promoted to resident engineer on the Camino-Sportsman's Hall grading job, El Dorado County. H. B. La Forge has been assigned to this contract as assistant to Mr. Church.

Gets Promotions.

W. T. Rhodes, assistant resident engineer on the convict work in the Merced River Canyon, has been promoted to resident engineer. T. W. Voss, attached to the Kern River convict camp, has been similarly promoted.

Ross Westbrook, formerly assistant resident engineer on the Beaumont paving project in Division VIII, has been transferred to Division VI for work near Fresno.

Division VII Gets Surprise.

FOLLOWING the resignation recently of Miss Grace Brummette, for a number of years clerk in the Los Angeles office, Division VII was informed that she had become the bride of Edward Rawson, former superintendent in the south and now a contractor.

L. R. McNeely has been assigned to the Jahn and Bressi contract near Capistrano, Orange County, as assistant resident engineer.

Pierce Attends Convention.

R. E. Pierce, assistant division engineer in charge of maintenance, Division X, attended the national convention of the A. A. E. as a delegate from the Sacramento Chapter. The gathering took place during the early part of the month in Orlando, Florida.

Who said a woman can't keep a secret? Lorene Lucy Gibson, typist with Division X, has just announced the fact that more than a year ago she became the bride of James Kirkwood Young, a recent graduate of the University of California. The wedding took place in San Rafael.

Friends of Mrs. E. E. Fifield from Divisions III and X recently presented her with a silver vase upon the occasion of her departure from Sacramento to accept a position in Berkeley. She has been with the department as a clerk for a number of years.

From the Equipment Department.

J. K. Kinsman has been promoted to the position of assistant equipment engineer and has been placed in general charge of the shop work in the several divisions.

T. A. (Tommy) Mendenhall, popular mechanician for the Committee of Nine on its many trips about the state, is the proud father of a son who arrived May 31st.

Bridge Engineer Takes Bride.

Albert A. Lernhart, resident engineer for the bridge department, was married recently to Miss Lucile Whitney of Eureka.

Accepts Federal Position.

W. K. Reed, for a number of years resident engineer in Division III and VI, has resigned to accept a position as engineer in charge of the paving work under way in Yosemite Valley.

H. O. Ragan will be resident engineer in charge of the concrete shoulder work in Fresno County.

Al Gregory, draftsman in Division VI, has resigned and started on a trip around the world.

A. N. Wakefield, former chief of party, has been reappointed as assistant resident engineer in Division VI.

To be City Manager.

R. A. Watkins, superintendent equipment, Division X, has resigned to accept a position as city manager of Pittsburg, Contra Costa County.

DRESSING UP THE ROADWAY—Mower attachment on a light tractor cutting roadside growth near Stockton. This work improves the appearance of the highway and lessens the fire danger during summer months. (Division X.)

MOWING WEEDS IMPROVES APPEARANCE OF HIGHWAY

MOWING weeds and grass along the roadsides keeps the highways looking neat and orderly, particularly following seasons of as heavy rainfall as the last one which was particularly favorable for a rank growth along the right of way in many sections of the state.

Various methods have been tried to remove roadside growth; disking and grading have been resorted to. Where grading is necessary to widen shoulders and improve drainage conditions, it probably is justified, but after a satisfactory roadbed has been secured it is a heavy expense as means of removing weeds.

When slopes are loosened by grading and disking, considerable material may be washed away by rains, and in light soils winds create an undesirable dust condition. If weeds and grass are mowed, the roots remain and tend to hold the soil.

Pierce Makes Report.

These are some of the opinions expressed by Maintenance Engineer R. E. Pierce in a report to Division Engineer J. C. McLeod of Division X, which has been trying out a Roderick lean worm driven mower attachment on a Fordson tractor. Considerable roadside mowing has been done in San Joaquin County, starting in March with a second cutting about May 1st.

One man operates the outfit and can clean up about five miles of both sides of the highway per day. Pierce gives the cost per mile as follows: Labor 90 cents; rental Fordson and mower, 64 cents; materials, gas oil, etc., 26 cents; total $1.80 per mile.

Rubbish along the roadsides often causes trouble and in order to keep delays to a minimum the operator carries with him an extra guard and also extra teeth.

The Curse of Civilization.

A Yosemite Indian, who still lives in the same mountain clearing and the same little shack that his grandfather started, was questioned regarding a deed for a highway right of way. His answer was that he did not want the highway past his place unless he gets $500 because it brings "too many robbers."

The Oregon highway department, it is announced, has adopted the thickened edge type of cement concrete pavement. This is the design that has been used on California concrete pavements for the past several years.

Good roads, canals and navigable rivers by diminishing the expense of carriage, put the remote parts of a country nearly on a level with those in the neighborhood of a town; they are, upon that account, the greatest of all improvements.—*Adam Smith's "Wealth of Nations."*

The above map shows the federal aid highway system of California in its relation to other state highways. The roads shown on this map constitute the present state highway system, except in one or two minor particulars where the federal aid system includes short sections not designated state highways.

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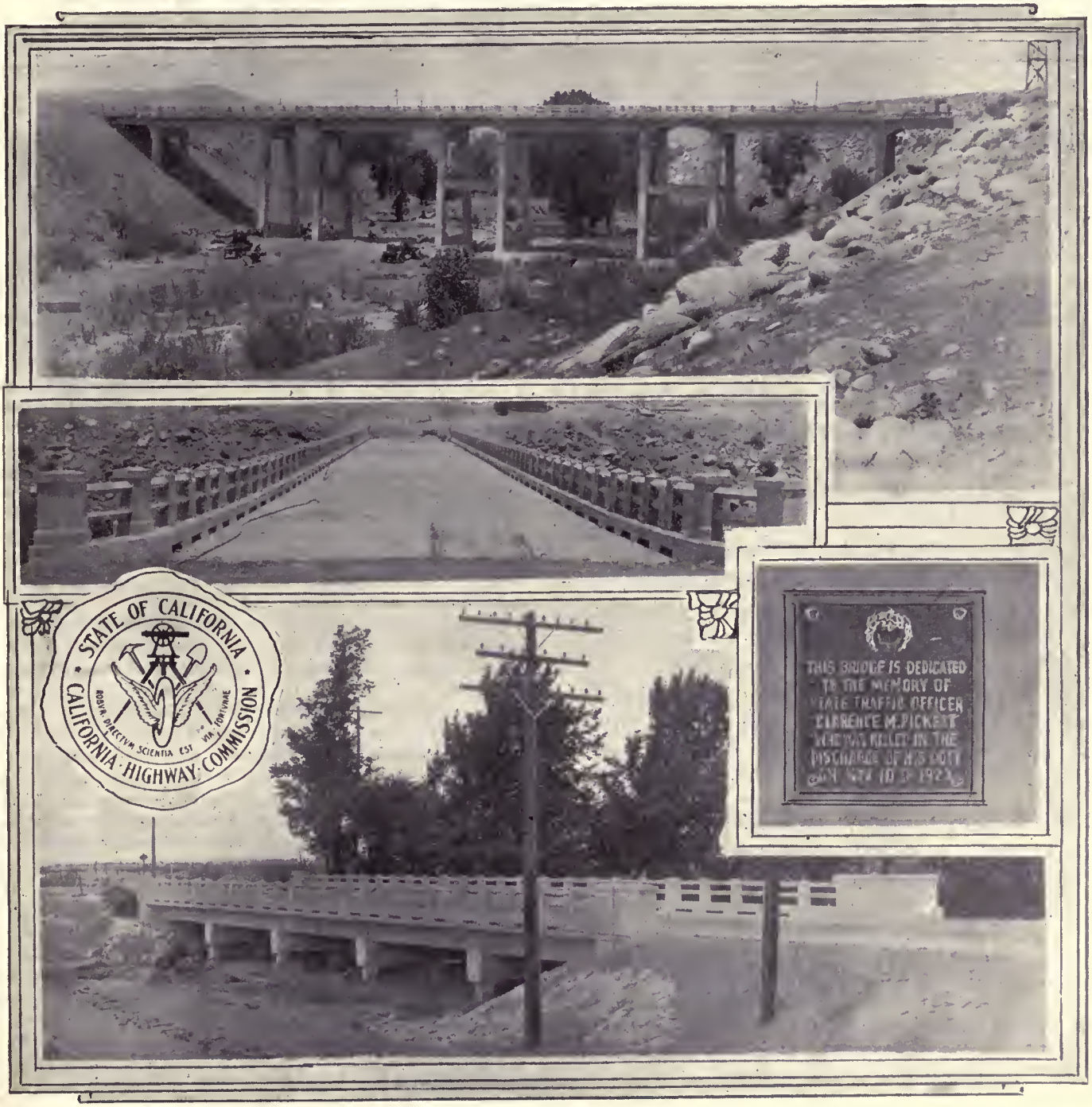
CALIFORNIA HIGHWAYS

A BULLETIN ISSUED BY THE CALIFORNIA HIGHWAY COMMISSION FOR THE INFORMATION OF ITS EMPLOYEES AND THE PUBLIC

Vol. 2 JULY, 1925 No. 7


STATE OF CALIFORNIA
CALIFORNIA · HIGHWAY · COMMISSION
ROBUR · DIRECTUM · SCIENTIA · EST · VIA · FORTUNAE
THIS BRIDGE IS DEDICATED
TO THE MEMORY OF
STATE TRAFFIC OFFICER
CLARENCE M. PICKETT
WHO WAS KILLED IN THE
DISCHARGE OF HIS DUTY
ON OCT 10 1922

NEW STATE HIGHWAY BRIDGES—*Above,* completed Cottonwood Creek bridge east of Bakersfield, on the Kern River project; *Center,* another view of the same structure, showing the ample roadway width; *below,* new bridge over the Chowchilla River, Madera County, on the San Joaquin Valley trunk line; *right,* bronze plaque placed on the Chowchilla bridge, dedicating it to the memory of State Traffic Officer Clarence M. Pickett, who lost his life in the vicinity in the discharge of his duty.

CALIFORNIA HIGHWAYS

HARVEY M. TOY, Chairman;
N. T. EDWARDS and LOUIS EVERDING, Commissioners.

ROBERT M. MORTON, State Highway Engineer.

W. F. MIXON, Secretary.

We are pleased to permit publication of any of the matter contained herein or to loan cuts and this privilege is extended newspapers and periodicals without restrictions.

FRANK B. DURKEE - - - Editor
P. O. Box 1103, Sacramento, California.

Vol. 2. JULY, 1925 No. 7

CALIFORNIA HIGHWAY DEPARTMENT

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N. T. EDWARDS, Commissioner, Orange

LOUIS EVERDING, Commissioner, Arcata

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G. R. WINSLOW, Maintenance Engineer

HARLAN D. MILLER, Bridge Engineer

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L. V. CAMPBELL, Office Engineer

BEN H. MILLIKEN, Superintendent of Convict Road Camps

HERMAN B. WEAVER, Chief Accountant

LOWELL R. SMITH, Purchasing Agent

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H. S. COMLY, Division II, Redding
F. W. HASELWOOD (Acting), Division III, Sacramento
J. H. SKEGGS, Division IV, San Francisco
L. H. GIBSON, Division V, San Luis Obispo
J. B. WOODSON, Division VI, Fresno
S. V. CORTELYOU, Division VII, Los Angeles
E. Q. SULLIVAN (Acting), Division VIII, San Bernardino
F. G. SOMNER, Division IX, Bishop
J. C. McLEOD, Division X, Sacramento

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THE PACIFIC HIGHWAY— A DREAM COME TRUE

IT IS SELDOM an engineer has the opportunity that has come to Harry S. Comly, the loquacious Division Engineer of Division II, headquarters, Redding. Mr. Comly entered the state service from San Diego in 1912 as Chief of Party, and has advanced by various promotions to the position of Division Engineer. As a member of the staff of Division II in the early days of the highway work, he had an important part in the planning and construction of the first state highway through the Sacramento Canyon. He knew every turn in the old county road before the building of the state highway, at the time when an automobile trip from Redding to Oregon was an unusual undertaking, attempted only by the most daring. Inter-county traffic at that time was insignificant; seven hours was required for the trip from Redding to Dunsmuir.

Engineer Comly witnessed the almost unbelievable development of traffic after the completion of the original state highway in California and the paving of the Pacific Highway in Oregon; he realized years ago that the day would come when the inadequacy of the highway first built by the state would be apparent to everyone. For years every trip through the canyon has wrenched his heart because of inability to make obvious improvements in the highway location and width, improvements to an engineer fascinating in their simplicity, but overwhelming in cost.

The general public recognition of the necessity for wider and straighter state highways, expressed by enactment of the gasoline tax legislation in 1923, has made it possible for him to plan and build the highway of his dreams through the "Canyon." The rebuilt road will reduce the safe driving time to two hours.

Seldom does a highway engineer have such an inspiring opportunity later to correct insufficiencies in early work, beyond his control to perfect in the first construction. The reconstructed Sacramento Canyon highway will stand for years as a monument to the unwavering ambition, engineering skill, and faithful service of Harry S. Comly, Division Engineer, Division II, California Highway Commission.

Netty—"Would you marry for money?"
Letty—"Well, I hope Cupid aims at me with a Pierce-Arrow."
—*Judge.*

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SAVINGS IN DISTANCE WILL MORE THAN PAY FOR RECONSTRUCTION OF PACIFIC HIGHWAY THROUGH SACRAMENTO CANYON

ENGINEER EXPLAINS INTERESTING FEATURES OF PROJECT

By H. S. Comly, Division Engineer

THE RAPID advancement in the standards of highway construction in California, during the past ten years, is forcibly apparent in the reconstruction of the Pacific highway, now under way between Redding and Dunsmuir, in Shasta County.

H. S. Comly

During the early stages of state highway construction in California a comparatively small amount of money was available with which to build a large mileage of highway; standards of construction, of necessity, were not high. Existing traffic demanded that the centers of population be first connected with paved highways, and the road from Redding to Yreka was considered more as a county seat lateral, to connect Siskiyou County with the remainder of the state, than as a major interstate trunk line. There was no interstate traffic and little local use of the existing county roads.

In accordance with the situation then existing, engineers of the department were instructed, if possible, to build a road through the Sacramento Canyon at an expenditure of $4,000 per mile. It became apparent as soon as surveys were under way that this could not be done, and, after the work was completed to the lowest standard which would come within the meaning of the word "highway," a seventeen-foot graded road had cost an average of $10,000 per mile. The grading was done between the years 1914 and 1917, and represents the 1915 standard of California mountain road construction.

Increasing Traffic Must be Served.

In 1923, when the commission decided to complete the main trunk lines and interstate connections, it became apparent at once, because of the fact that the traffic had increased so rapidly during the previous eight years, that the Sacramento Canyon section of the Pacific Highway had been built on too low a standard. Placing of pavement on the crooked, narrow grade could not be considered. Decision was made for a bold relocation on standards which would fulfill the demands of present and future traffic.

Surveys for reconstruction of the sixty-five miles of highway grade between Redding and Dunsmuir were started late in 1923. Construction work began in January, 1924. Twenty-one miles already have been completed and thirteen miles more are under construction and will be finished late this fall. On this portion, the distance has been shortened three miles, the new highway measuring only thirty-one miles. A location survey for the remainder of the canyon section is about finished and shows a total saving of 6.5 miles. When the reconstruction is completed, the distance from Redding to Dunsmuir will be reduced from 65 to 58.5 miles, or 10 per cent.

Saving in Distance Pays for Reconstruction.

Assuming the average cost of operating a motor vehicle to be 7½ cents per mile, the shortening of distance will save every vehicle traversing this section of highway about 50 cents per trip. Traffic now averages, throughout the year, about 1000 vehicles a day, thus the shortening of the highway will save the traveling public in operating costs $500 per day, or approximately $183,000 a year. Capitalizing this economic saving at 5 per cent, the saving in distance alone would warrant the expenditure of $3,660,000.

The cost of the reconstruction, including bridges, will be about $2,750,000. From the standpoint of pure economics, the reconstruction more than pays for itself by the factor of distance saving alone, based on present traffic. The distance to be paved will be about fifty-six miles, and this will cost approximately $2,000,000. The shortening of distance will not only pay for the reconstruction but also a large part of the paving bill.

These figures are rather startling in view of the fact that they are based only on present day traffic. It may be conservatively estimated that traffic will more than double during the next five years, by which time it is hoped the paving will be completed.

Saving of distance is by no means the only important feature of this work. If it were possible to capitalize the improvement in width, alignment and grade, the figures would be even more surprising. The width of the completed roadway, including drainage ditches, will be twenty-seven feet on sidehill construction and thirty feet where the construction is not so heavy, as compared with seventeen feet on the old grade.

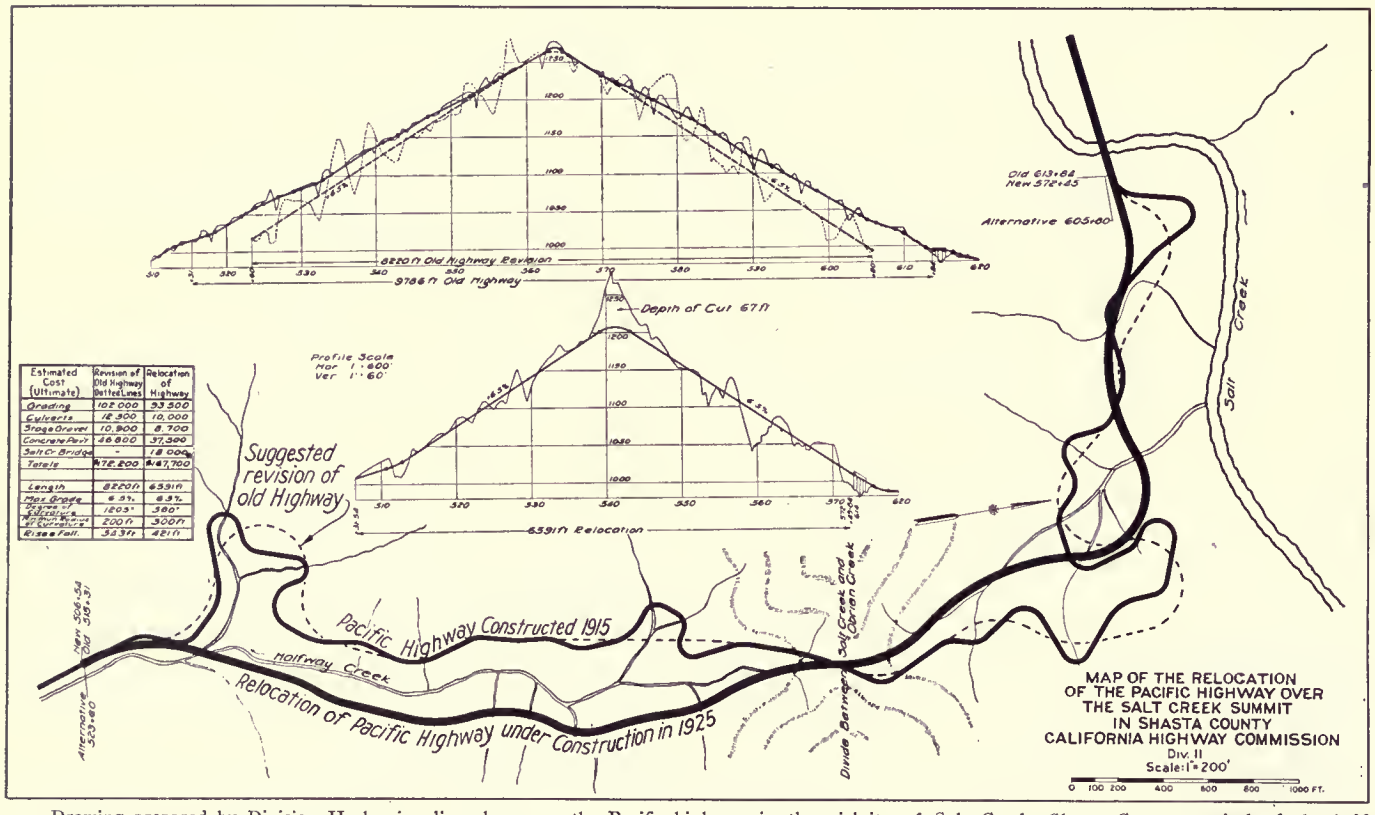
The minimum radius of curvature will be 300 feet, as against fifty feet on the original highway. The number of curves will be reduced more than one-half. While the maximum grade will still be 6½ per cent, several miles of maximum grade will be entirely eliminated, and many more will be reduced to 4 per cent or less. The total ascent and descent will be greatly reduced.

What advantage this means in increased speed, coupled with increased comfort and safety of traffic, in accidents prevented and lives saved, can not be estimated in dollars and cents; the advantage can not be denied, however.

Thorough Investigation Brings Results.

In planning the reconstruction through the Sacramento Canyon, exhaustive investigations were made to insure attainment of the most satisfactory results. Various possible solutions of each problem were considered, preliminary lines run, projections made and comparisons of cost studied. These investigations and the final location, including plans, cost, on the average, $1,250 per mile, or 2½ per cent of the cost of the work. While it is not possible

(Continued on next page.)


Suggested revision of old Highway
Pacific Highway Constructed 1915
Relocation of Pacific Highway under Construction in 1925
Depth of Cut 67 ft.
Profile Scale Hor 1"=600' Ver 1"=60'
8220 ft Old Highway Revision
9786 ft Old Highway
6591 ft Relocation
Old 613+84 New 572+45
Alternative 605+80
Alternative 503+80
Salt Creek
Halfway Creek
Divide Between Salt Creek and Clear Creek
MAP OF THE RELOCATION OF THE PACIFIC HIGHWAY OVER THE SALT CREEK SUMMIT IN SHASTA COUNTY CALIFORNIA HIGHWAY COMMISSION Div. II Scale: 1"=200'
0 100 200 400 600 800 1000 FT.

Estimated Cost (Ultimate)	Revision of Old Highway Betterments	Relocation of Highway
Grading	102,000	93,500
Culverts	18,300	10,000
Stage Gravel	10,900	8,700
Concrete Pvmt	38,800	37,500
Salt Cr. Bridge	-	18,000
Totals	$172,200	$167,700
Length	8220 ft	6591 ft
Max. Grade	6.3%	6.3%
Degree of Curvature	1205°	580°
Min. Rad. of Curvature	200 ft	300 ft
Rise & Fall	33.3 ft	42 ft

Drawing prepared by Division II showing line change on the Pacific highway in the vicinity of Salt Creek, Shasta County, typical of the bold relocation of the road throughout the Sacramento River Canyon. Estimates of the yardage, in the chart at the upper left-hand corner, show construction on the line adopted to be actually cheaper than the suggested widening and straightening of the original grade, built in 1915.

SAVINGS IN DISTANCE OF PACIFIC HIGHWAY

(Continued from page 3.)

to arrive at an exact saving by reason of the excess preliminary cost, it is probable an expenditure of $500 per mile, over the minimum cost of surveys and plans, is saving not less than $2,500 per mile in construction.

Besides this actual saving, we have been able to arrive at the most perfect final location consistent with the standards adopted, and have assurance that the alignment and grades are the best that can be worked out.

While a considerable part of the improvement is brought about by widening the existing roadbed and flattening or eliminating curves, there are many instances where a complete abandonment of the old highway has proved advisable and economical.

Salt Creek Typical Saving.

A typical instance of this is illustrated by the accompanying sketch of the relocation over the Salt Creek divide, now under construction. As indicated in the tabulation accompanying the map, the ultimate cost of the improvement by complete relocation is less than by a simple line revision and widening of the existing highway, as indicated by the dashed line. This is true despite the fact that a concrete bridge across Salt Creek had to be demolished and a larger one on a higher grade line built in its place. The relocation necessitated an eighty-foot cut at the summit, containing about 80,000 cubic yards of excavation.

It also will be noted the use of curves of 300-foot radius was not possible along the old highway, and that the line revision included two bad loops made up of curves of 200-foot radius. The relocation has only two curves of less than 500-foot radius, one of 300-foot radius and another of 325 feet. The total curvature is reduced from 1205 degrees by line revision, to 580 degrees by relocation. It also will be noted the relocation is 1629 feet shorter than the line revision in a distance of a mile and a half.

Many Curves Eliminated.

Compared to the highway of 1915, the relocation saves six-tenths of a mile in a distance of 1.9 miles, *and reduces the number of curves from forty to fourteen.* The improvement in width is denoted on the sketch which shows the relative width by exact scale. The rise and fall is reduced by 130 feet, and the length of maximum grade by about one-half mile.

It is natural to ask why this location was not used in 1915. The answer is that the 1.9 miles of highway at Salt Creek, as located at that time, cost about $25,000; this was considered expensive. There was not available the $100,000 necessary for grading and culverts on the relocated highway between the same two points.

The total registration of motor vehicles in California in 1915 was 190,000; now it is more than 1,350,000. The gasoline tax provides funds for reconstruction.

MAINTENANCE STATION AND SHOPS BUILT AT CRESCENT CITY

THE board of supervisors of Del Norte County recently gave the state a ninety-nine-year lease on a 13-acre parcel of land near Crescent City on which to establish a maintenance station and shop for the repair of equipment.

Construction of a corrugated iron truck shed and shop has been completed. The truck shed is 27 by 72 feet, and the shop 28 by 36 feet.

The site is near the northern city limits of Crescent City, and close to the proposed junction of the Redwood and Roosevelt highways.

The establishment of this camp will greatly facilitate the work of both the maintenance and equipment departments, as considerable activity is centered about this location and transportation to the present shops at Eureka is difficult and expensive because of the time involved.

AND AESOP SAID—"NECESSITY IS THE MOTHER OF INVENTION"

By Fred J. Grumm, Engineer of Surveys and Plans.

TWO thousand years ago Aesop said (we can credit it to him, at least): "Necessity is the Mother of Invention." Necessity has other children too; she's mother, aunt or other close relation to all of Invention's little brothers, sisters, cousins and kin. Resourcefulness and Expediency are certainly close cousins of Invention; at any rate, Necessity surely is more than a stepmother to them.

The sidehill wampus, the one-man survey party, catching snipe by lantern light with gunny sacks are mythical, entertaining and amusing subjects of discussion familiar to all S I's. That any one of them should be proven a reality is perhaps more than can be accredited. But don't underestimate the power of Necessity who bred Invention, Resourcefulness and Expediency.

The sayings of the wise ancients are merely the terse expressions of truths proved by many experiences. Another proof of the axiom written above has been found.

The Necessity and the Difficulty. Between Ricardo and Little Lake, on the road from Mojave to Independence, there are two existing roads. One, the county road, runs from Ricardo to Inyokern and then follows the railroad up the floor of the valley to Little Lake. The other lies further to the west on the westerly slope of the valley. A location survey has been made following along the general route of the westerly road. No survey of the valley road is at hand. Certain maintenance and construction work is to be undertaken on this section of highway. A choice of routes is necessary. A comparison of alignment, grades and condition of the two roads is needed to make this choice.

Somner was up against it. He had no survey of the valley route; the department head from headquarters was expected on the evening train; it was noon and he had no survey party. From Ricardo to Little Lake is 35 miles, more or less.

Enter Resourcefulness and Expediency, children of Necessity. He had an automobile with a good speedometer, one of those dollar compasses, a pencil, paper and a book of tables. He organized a *one-man* survey party. It was complete from locator to axeman; in fact, it even included a division engineer.

The result was a *Triumph over Difficulties.* He made his survey of 20 odd courses tying in just north of Ricardo. Down at Mojave, using the landlady's dining room table, the survey was plotted on the map of the precise location survey. And it *checked at the proper point within 200 feet.* Two hundred feet in 35 miles! Have you done any better with your stadia surveys? Oh yes, once—maybe! When the department head arrived there was something to offer as a basis for comparison.

In the words of Chester Gump's Chinese servant: It is written that the Resourceful Person will Triumph over Difficulties.

LESSON FROM THE EARTHQUAKE

THE LESSON to be learned from the Santa Barbara earthquake, as far as highway building is concerned, is that stability of construction has proved its worth. Bridges and other highway structures, both north and south of Santa Barbara, built by the county but on state specifications, withstood the shocks of the recent earthquake without consequential damage.

Except for slides in deep cuts, there was no serious interference with traffic; in fact, the highway was not completely closed to traffic at any time while rail transportation was held up for a period of seventeen hours.

It is not contended pavements and bridges built on state specifications will withstand any shock that might occur; but the fact remains that the state bridges in the vicinity of Santa Barbara were practically undamaged by the earthquake, which wrought serious and extensive structural damage within the city.

High Standards—Real Economy.

The state highway department is often criticised, particularly by county authorities, for expenditures for bridges. It is frequently asserted that they are structurally of heavier design than is necessary and, therefore, more costly than is needed to care for state highway traffic.

There is every reason to believe that had the state bridges in the vicinity of Santa Barbara been of lighter and less stable design, they would not be standing today. The earthquake has proved the worth, and the necessity for, present high standards for state highway bridges.

There is genuine economy in high standards. Of that, the Santa Barbara earthquake is ample proof.

NEW PLAN FOR PRISON CAMPS.

From August 17, 1923, to May 31, 1925, prisoners in the three road camps had earned a total of $79,808.90 under the convict pay law, of which $18,085.02 had been paid to dependents. The average daily net cash earning per man was $0.294. Permissible earnings under the law are $0.75 per day.

Superintendent Ben H. Milliken and the Board of Prison Directors have worked out a plan by which men within the prisons, who are eligible to go to the camps, make formal application in anticipation of vacancies that may occur. By examination ahead of time, men are always available for assignment to the road camps and there is no delay in filling requests for men.

VIEWS ON THE SKYLINE BOULEVARD, SAN MATEO COUNTY—Dotted lines show location of the old county road at this point, the sharp curves of which have been eliminated by the new state highway.

CALIFORNIA FOREST HIGHWAY SYSTEM APPROVED

FEDERAL BUREAU MAKES REPORT OF PROGRESS TO DATE

AFTER several years of negotiation with the Bureau of Public Roads and the United States Forest Service, the California Highway Commission several months ago submitted to the Secretary of Agriculture, pursuant to the rules and regulations for administering forest roads and trails under the provisions of the Federal Aid Highway Act, a system of forest highways for California.

This system, in accordance with the recommendations of the Bureau and the Forest Service, has been approved by the secretary and made public by the Forest Service. The importance of this action lies in the fact that the roads in this state upon which forest highways funds may be expended are now definitely determined and construction of the system may proceed as funds are made available by congress.

The public should understand, however, the designation of a road as a forest highway by no means assures its construction, for the reason that, under present appropriations, many years must elapse before the system can be completed.

Forest highways, as defined by act of congress, are roads in or adjacent to the National Forests, beneficial to the forests and nearby communities. That the forest roads may bear their proper relation to the federal aid and state highway systems of the various states (forming a coordinated system of roads), the regulations require that the State Highway Commission, the Bureau of Public Roads, and the Forest Service shall join in designating the routes to be included.

California Selections Difficult.

The large number of routes proposed for inclusion made the selection of the California system difficult. The basis of the final agreement reached provided that all state highways within the forests be included in the system of forest highways, together with a considerable mileage of county roads selected from among those proposed by the Forest Service.

The routes included have a total of 2,045.5 miles, of which 1,321.5 miles are state highways and 724 miles county highways. The system does not include minor forest roads and trails directly under the jurisdiction of the Forest Service, which are constructed with forest development funds.

In approving the California system, the Secretary of Agriculture did so subject to several conditions; namely, that the final location of the routes selected is subject to surveys and other information which may develop; and that the selection of any routes as forest highways will not bar expenditure of forest development funds on such routes if found advisable by the Forest Service.

Appropriations Meager.

California's allotment of forest highway funds from present congressional appropriations is approximately $500,000 per year, which is small as compared with the estimate of more than $30,000,000 for the completion of the system.

Appropriations of funds for the construction of forest highways, however, is a recognition by the federal government of its obligation toward the states, resulting from the withholding in perpetual government ownership of a vast acreage of nontaxable lands within the forests.

The San Francisco office of the Bureau of Public Roads has prepared for the State Highway Commission a tabulation of the routes included in the California forest highway system, together with other information, and including expenditures of federal and state and county cooperative funds disbursed by the bureau. The tabulation shows net federal expenditures on the forest road system, to May 31, 1925, of $3,166,840. The average cost per mile naturally has depended upon the character of the road and the country traversed. The expenditure in some instances has amounted to only a few thousand dollars per mile, while in many locations it has been $30,000 to $40,000, and in one instance exceeded $100,000 per mile. Similar expenditures undoubtedly will be necessary in the future.

Engineer Furnishes Tabulation.

C. H. Sweetser, district engineer, states that no particular accuracy is to be attached to the estimates of the cost of comple-

BRIDGE AT BIG BEAR LAKE—Reinforced concrete bridge built across the crest of the dam at Big Bear Lake, San Bernardino County, on the route of the Rim of the World state highway. The project was financed by the county and the United States Forest Service as a forest highway project.

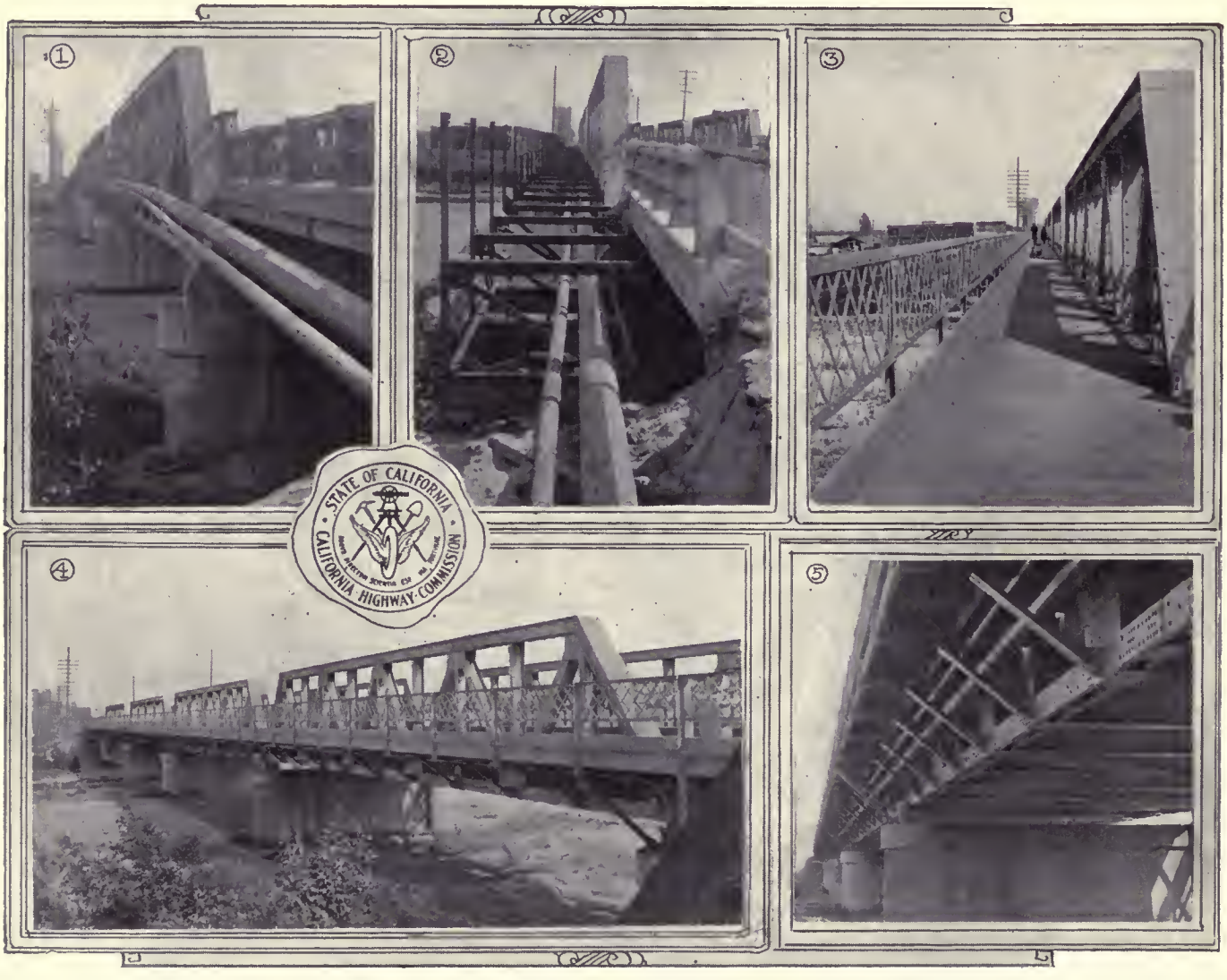
tion of the various projects, which, in most instances, are not based on actual surveys. The figures given for the average cost per mile are the actual final costs for completed projects and the probable final costs for going projects. Funds supplied other than by the federal government have been deducted in the final total to show net federal expenditures.

The tabulation of the bureau is as follows:

FEDERAL EXPENDITURES ON HIGHWAYS IN CALIFORNIA FOREST HIGHWAY SYSTEM MAY 31, 1925.

Route No.	Forest Highways on State Highway System: Project	Termini	National forest	Length miles	Federal funds to May 31, 1925	Average cost per mile	Miles surveyed, built or under construction by bureau	Estimated cost of completing system	Remarks
1	Crescent City	F. Bdy, U. S. Fork-Oregon line	Siskiyou	36.0	$675,519 61	$40,977 44	26.6	$1,214,000 00	
2	Klamath River	Weitchpec-Mouth of Shasta River	Klamath	135.0	1,247,310 91	25,455 32	49.0	2,500,000 00	
3	Trinity River	Junction City-Horse Summit	Trinity	65.0	58,430 09	12,431 93	4.70	1,857,000 00	
4	Peanut-Van Duzen	Peanut-Mad River Bridge	Trinity	31.2					Completed.
8	Upper Lake-Bartlett	Upper Lake-Hough Springs	California	28.0				685,000 00	
9	Sacramento Canyon	Delta-Weed	Shasta	46.0					No estimate.
13	Alturas-Cedarville	W. Bdy.-Cedarville	Modoc	10.0	117,776 27	15,275 78	7.71		
14	Redding-Alturas	Adin-Canby	Modoc	21.8	209,182 63	19,191 06	10.90	1,060,000 00	
15	Redding-Alturas	S. E. Cor. Forest near Burney	Modoc	4.0					
18	Paynes Creek-Susanville	12 Mi. W. Mineral-Deer Creek Meadows	Lassen	35.0	217,879 89	18,156 65	12.0	150,100 00	
19	Paynes Creek-Susanville	Coppervale-Susanville	Lassen	15.0					
22	North Fork Feather River	F. Bdy.-Quincy	Plumas	50.0					No estimate.
25	Nevada City-Downieville	N. San Juan-Downieville	Tahoe	33.0					No estimate.
29	Emigrant Gap	Emigrant Gap-Truckee	Tahoe	31.4	83,293 97	33,967 67	3.69	770,000 00	
30	Truckee-Meyers	Truckee-Meyers	Tahoe-El Dorado	48.0				1,080,000 00	
31	Tahoe-Brockway	Tahoe City-Nevada Line	Tahoe	12.0				120,000 00	
32	Placerville-Lake Tahoe	Pacific Station-Nevada Line	El Dorado	43.7				545,000 00	
33	Jackson-Carson Pass	Cookes Station-Willow Creek	El Dorado-Mono	42.5					No estimate.
34	Woodfords-Minden	Woodfords-Nevada Line	Mono	6.0				62,500 00	
35	Carson-Big Trees	Murphy-B. T.-Mouth of Silver Creek	Stanislaus-Mono	52.5				625,000 00	15 mi. not on State System.
36	Topaz	2 mi. south Coleville Nevada Line	Mono	10.0				159,000 00	
37	Bridgeport-Tahoe	Bridgeport-Meyers (Osgood Junction)	Mono-El Dorado	96.4				1,675,700 00	
38	Sonora Pass	Soulsbyville Junction (Pooleys) Cabin Creek	Stanislaus-Mono	66.4	27,065 03	9,343 26	12.60	664,000 00	
39	Tioga	Big Oak Flat-Yosemite NP Bdy.	Stanislaus	32.0					No estimate.
40	Tioga	Yosemite NP Bdy. Red Rock Brdgpt, Hwy.	Stanislaus	12.5					No estimate.
41	Red Rock-Bridgeport	Magee Creek-Mono Lake	Inyo-Mono	46.0				Included in	
42	Red Rock-Bridgeport	Inyo-Mono County Line-Whiskey Creek	Inyo-Mono	10.0				Route 37	
43	Big Pine-Oasis	Big Pine-Deep Springs Ranch	Inyo	27.9				505,000 00	
44	Crane Flat	Sequoia-Crane Flat	Stanislaus	7.0					No estimate.
45	Mariposa-El Portal	Briceburg-El Portal (Park Bdy.)	Sierra	17.9				1,001,000 00	
49	General Grant's Park	Park Bdy.-Kings River	Sequoia	20.0					No estimate.
51	Sequoia National Park	Three River R. S.-Park Bdy.	Sequoia	6.0					No estimate.
53	Bakersfield-Freeman	Cottonwood Creek-Bodfish	Sequoia	32.8				1,050,000 00	
54	Cuyama	Dutard Ranch-Cuyama River Bridge	Santa Barbara	15.5	594,838 48	41,694 71	15.51	646,685 02	
55	Cuesta Pass	Cuesta-San Luis Creek	Santa Barbara	3.6					No estimate.
57	Ridge Route	Castar Canyon-N. Bdy. Forest	Santa Barbara	20.0					No estimate.
60	Arroyo-Seco	Pasadena Mt. Wilson (via Oakwild)	Angeles	25.0	21 471 23	24,951 23	3.80		County paid bal.
62	San Gabriel	Azusa-Pine Flat	Angeles	28.0	159,335 65	113,811 17	1.40	1,750,000 00	of $77,143 66.
64	Cajon	Devore-Summit	Angeles	15.2					No estimate.
65	Bear Valley	Metcalf Creek Westerly along the crest to a point on F. Bdy.	Angeles	45.0	540,974 50	36,672 86	15.93	1,440,000 00	
66	Fawnskin	Bear Lake Dam-Bear Valley RS.	Angeles	9.8					No estimate.
70	El Cajon-Jacumba	Alpine-La Posta Ranch	Cleveland	28.4				102,500 00	
	Totals, Forest Highways on State System			1,321.5	3,953,078 26		163.84	$19,662,485 02	
	FOREST HIGHWAYS NOT ON STATE HIGHWAY SYSTEM.								
35	Carson Big Trees	Murphy-Big Trees	Stanislaus	15.0	$158,010 31	$15,620 05	15.0	$242,117 21	65% complete.
5	Douglas City-Peanut	Douglas City-Peanut via Hayfork	Trinity	27.0				575,000 00	
6	Beegum-Peanut	Beegum Creek-Peanut	Trinity	22.0				470,000 00	
7	Mendocino Pass-Covelo	Covelo RS. mouth of Grindstone	California	50.0				1,204,000 00	
10	Weed-Medicine Lake	Weed-Morrison	Shasta	16.0				223,000 00	
11	Lava Beds	Lookout-Oregon Line	Modoc	64.0				881,000 00	
12	Black Canyon	Black Canyon-Timber Mt.	Modoc	22.0				382,000 00	
16	Willow Creek	Grass Hopper Valley	Modoc	30.0					No estimate.
17	Westwood-Pittville Butte Meadow	Worley's N. Bdy. Forest	Lassen	50.0					No estimate.
20	Almanor	Almanor Dam-Quincy	Plumas	32.0				896,000 00	
46	Mariposa-Big Trees	Chowchilla RS.-Wawona	Sierra	16.0	9,212 19	301 05	30.6	500,000 00	
47	Wawona-Auberry	Wawona-Auberry	Sierra	50.0				235,000 00	
48	Huntington Lake	Auberry-Huntington Lake	Sierra	40.0	43,729 80	6,526 83	6.70	225,000 00	Est. for 24 mi.
50	General Grant Park	For. Bdy.-Park Bdy.	Sequoia	6.0				84,000 00	
52	Glennville-Kernville	W.Bdy. E. Bdy. Forest	Sequoia	10.0				310,000 00	
56	San Marcos	Santa Inez R.-S. Bdy. Forest	Santa Barbara	11.0	65,699 12	38,941 81	4.6	360,000 00	
58	San Francisquito	N. Bdy. S. Bdy. Forest	Santa Barbara	16.0				574,000 00	
59	Boquet	Texas Canyon-E. Bdy.	Santa Barbara	16.0				726,000 00	Est. for 12 mi.
61	West Fork-San Gabriel	Red Box-Camp Rincon	Angeles	20.0				1,264,000 00	
63	Swartout	Valyermo-Cajon	Angeles	28.0				699,000 00	
67	City Creek	Fredalba Junction-S. Bdy.	Angeles	13.0					No estimate.
68	Mill Creek	Pine Knot-S. Bdy.	Angeles	25.0					No estimate.
69	Palomar	Nellie Warner Dam	Cleveland	16.0	4,693 97	438 68	10.70	347,000 00	
21	Deer Creek Meadows	Forest Ranch P. O.-D. C. Meadows	Lassen	38.0				624,000 00	Est. for 22.5 mi.
23	Blairsden-Quincy	Blairsden-Quincy	Plumas	25.0	1,904 92	352 76	5.40	481,000 00	
24	Gold Lake	Mohawk-Yuba Pass Junction	Plumas-Tahoe	15.0	3,140 66	185 84	16.90	212,000 00	
26	Yuba Pass	Downieville-Sattley	Tahoe	32.0	44,166 96	13,615 76	14.91	694,000 00	
27	Sierraville-Hobart	N. Bdy. S. Bdy. Forest	Tahoe	8.0				173,000 00	
28	Lemon Canyon	W.F. Bdy. Dages Creek	Tahoe	11.0				202,000 00	
	Subtotals, Forest Highways not on State System			724.0	$330,557 93		104.81	$12,673,117 21	
	Surveys, expenditures not included above (mileage included)				47,130 57	418 56	(112.60)		
	Less cooperative funds disbursed by Buresu of Public Roads				1,163,926 76				
	Total Federal funds disbursed				3,166,840 00				
	Grand Totals			2,045.5	$3,166,840 00		268.65	$32,335,602 23	

MAKING HIGHWAY BRIDGES SAFE FOR PEDESTRIAN TRAFFIC



SIDEWALK ON RIO HONDA BRIDGE, LOS ANGELES COUNTY—(1) Bridge before building of sidewalk; (2) method of caring for service pipes, which are supported by steel framework of pedestrian way; (3) the completed walk; (4) view of the bridge and sidewalk; (5) method used to attach trusses supporting sidewalk to steel framework of bridge. Necessity for sidewalks on state highway bridges is becoming more apparent in many parts of the state. They protect both the pedestrian and the motorist by keeping foot traffic off the traveled way. (Photos by Div. VII.)

INCREASING traffic on Whittier boulevard made it necessary to construct a sidewalk on the Rio Hondo bridge near Montebello, Los Angeles County, to permit pedestrians to cross in safety. The 24-foot width of roadway on the bridge became inadequate to accommodate both vehicular and pedestrian traffic, necessitating the addition of a 6-foot combination wood and structural steel walk on the north side of the bridge.

The K. O. Wetzel Company of Los Angeles had the contract for the work. W. J. Nelson, assistant resident engineer, supervised construction. Plans were made by the headquarters bridge department.

BAD DRIVING SHOWN AS BIG CAUSE OF HIGHWAY ACCIDENTS

STATISTICS of highway accidents involving motor vehicles, which seem to point clearly to congestion of traffic as the principal cause, have recently been compiled from newspaper reports of accidents in the states of Montana, Oregon and Washington by the Bureau of Public Roads of the United States Department of Agriculture. The bureau's study shows that Montana with the lowest registration has the smallest number of accidents per 1000 cars, while Washington with the largest registration has the most accidents per 1000 cars. This does not agree with national estimates which indicate that the rate of accidents decreases with increased numbers.

During a period of eight months newspaper reports of 1606 accidents in the three states mentioned were secured, and from the accounts given the causes of accidents classified as follows:

Faulty operation by driver, 1020; faults of others than drivers, 191; faulty equipment, 181; faulty highway conditions, 214.

The detailed statement of the causes of accidents shows that 711, or more than 40 per cent of the total, were caused by reckless or careless driving.

Of the 214 accidents caused by faulty highway conditions, nineteen were caused by narrow roadways and 150 by skiddy surfaces.

INVESTIGATIONS SHOW IMPROVED HIGHWAYS BRING REMARKABLE SAVING TO MOTORISTS IN OPERATING COSTS

A RECENT survey made in Kentucky shows, on the average, a saving of 2½ cents a mile in the cost of operation of a motor vehicle over improved highways as compared with unimproved roads. Sometime ago a similar investigation conducted in Iowa indicated approximately the same saving, and studies now going on in Washington are producing data along this line of interest to all highway engineers.

Data at hand indicate that the average American car travels 6000 miles annually. A saving of 2 cents a mile for 6000 miles amounts to $150 a year. For seventeen million automobiles, this would mean a saving of $2,550,000,000 a year on gasoline, tires, parts, upkeep, renewals and all phases of operation.

This would be the total saving if every mile over which an automobile traveled was improved. But of course only 60,000 miles of highway have been improved by federal aid. This 60,000 miles represents slightly more than 2 per cent of the total highway system which amounts to approximately two and a half million miles.

A 10 Per Cent Saving.

Two per cent of $2,550,000,000 gives $51,000,000 which can be legitimately credited to federal aid. The total capital expenditure for federal aid was $500,000,000 which yields $51,000,000 a year or ten per cent in saving to the user of improved highways.

The study made by the Iowa State College, the Iowa Highway Commission and the Bureau of Public Roads showed that the gasoline consumed on a paved road was only approximately one-half the gasoline consumed on a dirt road per unit of traffic. Incidentally the investigation developed that the gasoline consumed per unit of traffic can be taken as an index of the other costs of motor vehicle operation.

It showed in fact that there is a definite relation existing between the gasoline consumption per unit of traffic and other items of cost in vehicle operation. F. R. White, Chief Engineer of the Iowa Highway Commission, estimated that through improvement of a road surface the gasoline consumption is cut in two, the cost of tires is cut in two, the same applying to other items, including depreciation and repairs.

For the first time these studies make it possible to present in terms of dollars and cents the difference in cost to the motorist and the public in general between improved and unimproved roads.

Iowa Traffic Studies.

According to the Iowa study, traffic equaling 500 vehicles per day over earth roads requires an annual expenditure from both private and public funds of $25,600 per mile, while a similar amount of transportation over a concrete surface costs $20,650 per mile.

This means that for a light traffic earth road carrying 500 vehicles a day there would be saved $4,950 per mile, per year, if the same traffic went over a paved road surface. Assuming the cost of paving a dirt road to be $25,000 per mile, the saving in transportation cost would actually pay for the capital outlay in from four to six years. The difference between the cost of operation on a gravel road and a paved road would pay for the difference in the cost of construction in three years.

SHOPS TURN OUT ONE-MAN TREE WATERING OUTFIT

By R. H. Stalnaker, Equipment Engineer.

HEADQUARTERS shop has just completed equipping two Davidson III Standard tank trucks with "one-man" tree watering attachments. The idea of *"one-man"* attachments was not original with the shop, but was developed, it is understood, by Assistant Division Engineer S. T. Corfield in Division VI, a year ago.

However, the arrangement worked out in the Sacramento shop has some new features that may be of interest to the divisions.

Illustration I, shows the outfit in position for traveling. The pipe is swung back against the truck and latched into place so it will retain its position during transit.

Number II, shows the pipe swung at a right angle to the truck and in position for tree watering. To keep this pipe from swinging back while the truck is in motion between the trees, a short piece of rope is fastened to the end of the pipe and to a convenient point on the driver's seat.

To Water Trees at Night.

It will also be noted that these trucks have been equipped with acetylene searchlights mounted crosswise to the truck on the driver's seat. Division III plans to do its roadside tree watering at night this year and the light is needed for this reason. A forty-five degree ell also was placed on the end of the discharge pipe so as to direct the stream to better advantage.

The other illustrations (III and IV) show a remodeled three-ton trailer for Division III's use in hauling a Best 30 tractor, recently purchased. The rail at the back of the trailer is removed when loading and replaced to hold the blocking. The ramps are arranged to hook over the frame at the rear to avoid the possibility of their displacement while the tractor is on them.

Incidentally, the lower ends of the ramp planks were beveled off at an angle of forty-five degrees after the photographs were taken in order to facilitate the running of the tractor on the ramps. The under corners of the planks also were shod with angle iron to prevent chipping.

OUTPUT OF HEADQUARTERS SHOP—*Left* and *center,* one-man tree watering outfit for use of Division III; note pipe operated by driver from seat and light for night watering; *right,* heavy duty trailer built at the shops. It is used for moving tractors and heavy machinery.

BUILDING UP THE SHOULDERS ON THE STOCKTON-OAKLAND HIGHWAY—Betterment work under way near Tracy where material is being secured from an abandoned levee to make fills and widen shoulders at either side of the new twenty-foot pavement. The appearance and safety of this section of the highway is being greatly improved. (Division X.)

IT CAN BE DONE

THE Herculean task of locating and constructing a modern highway through the Truckee River gorge, a gash through the Sierras half in California and half in Nevada, is well under way. When the matter of building a trans-Sierra highway to provide a northern California connection with Nevada and points east came before the California Highway Commission some years ago, it created one of the most contentious controversies over road location ever generated in the state.

Two routes were available across the mountains, one by the Dog Valley grade and the other through the Truckee River canyon. The Commission examined the narrow canyon with its precipitous rock walls, noted the existing railroad, power transmission lines and water flumes and characterized the location as wildly extravagant if not actually impossible. But the scenery was magnificent and the route had the advantage of offering a water grade and those who sponsored it realized what a charming entrance to California it would make for the motoring hordes who were to come.

A change in administration brought a Highway Commission sympathetic to the river road and now both Nevada and California are exerting every energy to complete the project by a year hence. Construction difficulties are enormous and the final story of the building of the road will be an entrancing romance as well as a refutation of the prediction that the project was not feasible. Numerous crossings of the river and the railroad are only a few of the difficulties met and overcome but when the road is eventually opened to traffic it will furnish a magnificent introduction to the Golden State.—*Western Highways Builder.*

Habit Clings. The old-timer who worked his way through college is now working his son's way through.—*Minneapolis Star.*

OLDEST TAX.

The idea of a highway tax is "old stuff." Back in 1661, during the time of King Charles II in England there were 400 hacks that were licensed for operation in London, Westminster and a vicinity of six miles. The money was used to pave the streets.—*New Hampshire Highways.*

A CAPITAL IDEA

(From *Western Highways Builder.*)

THE laconic Mr. Morton, State Highway Engineer of California, who has a faculty for reducing the empyrean philosophical ventures of his confreres at engineering meetings to mundane simplicity, is to be credited with the conception of another capital idea. At the San Francisco regional conference on highway marking and standardization of directional and cautionary signs he advanced the suggestion that a suitable design for markers for the proposed national highways be made the object of a competition in which the leading artists of the republic should be invited to participate.

Such a competition would accomplish two desiderata, i.e., primarily and of greatest moment, stimulate an intensive interest in highway improvement and, secondarily, result in the development of a marker of artistic beauty as well as utility. The publicity that would accrue from a nation-wide competition of this character would rejuvenate a lethargic interest in road construction and serve, perhaps, to impress the importance of this great national activity more forcibly upon the public consciousness.

I trust that the plan will receive the serious attention and support of other regions where no doubt its potentialities for good will be readily recognized.

On the Job.

Despite serious personal loss, Maintenance Foreman W. P. Rothert, stationed at Santa Barbara, was on the job the day of the earthquake and assisted in keeping traffic moving over the state highway.

Funeral Parlor in the Rear.

"How did Black make his money so quickly?"

"He established branch junk shops close to all the important grade crossings in the country."

The Dickens You Don't.

"Did you see Oliver Twist, Aunty?"

"Hush, child. You know I never attend those modern dances."

DEDICATE NEW BRIDGE TO MEMORY OF SLAIN OFFICER

THE recently completed bridge over Chowchilla River, Madera County, on the San Joaquin Valley trunk line, has been dedicated with fitting ceremonies to the memory of State Traffic Officer Charles M. Pickett, who was murdered near the crossing, November 10, 1923, while in the discharge of his duty.

The new structure takes the place of an inadequate county-built bridge which has been a menace to traffic for many years. The commission has a record of nineteen serious accidents at the bridge site, seven of which proved fatal. A clear roadway width of twenty-four feet, provided by the new structure, will remove the probability of additional casualties in the future.

County Makes Contribution.

The need for a new bridge has long been recognized by the commission, and when Madera County in 1924 agreed to contribute $10,000 towards its cost, the work was immediately authorized. The completed structure, including approaches and ripraping, will cost approximately $15,000. It has a foundation of reinforced concrete piling and is protected from floods by hand placed granite riprap, nine inches thick, extended to the top of the roadway shoulders.

The bridge was planned and built under the direction of the bridge department. Proctor and Cleghorn, of Santa Rosa, were the contractors.

A bronze plaque embedded in one of the end posts of the bridge reads as follows:

> "This bridge is dedicated to the memory of State Traffic Officer Clarence M. Pickett, who was killed in the discharge of his duty on November 10, 1923."

Cottonwood Creek Bridge Finished.

Another bridge recently completed under the direction of the bridge department is the Cottonwood Creek span, east of Bakersfield on the Walker Pass highway, Kern County. The structure is of reinforced concrete, 310 feet long, and forty feet high. It has in all nine spans and is of the concrete tower type of construction.

The bridge is an important unit in the Kern River highway project and was financed through a contribution made the state by Kern County. J. L. Webster of Chico was the contractor. The bridge and approaches cost, including engineering, approximately $40,000.

On the front cover will be found illustrations of both the Chowchilla River and Cottonwood Creek structures.

McKESSON CONTACT MAN

CHAS. M. UPHAM, Director of the Highway Research Board, Washington, D. C., announces the extension of the board by the appointment of contact men from the various engineering colleges of the country. At the present time, eighty colleges have responded to the call and have signified their willingness and desire for cooperation by the appointment of a member of their faculty to act with the board. The contact man in every case has been one who has done considerable work along the lines of highway research.

Many important research problems are now being studied by the colleges, and it is felt that the activities of these institutions should be correlated with those of other research agencies. The university contact men working in conjunction with the contact men appointed by the state highway departments some time ago, fills a want that has been apparent.

The research agencies of the state highway departments and the engineering colleges are constantly at work to improve not only the construction of better highways, but also the economic factors that enter into the problem. The Highway Research Board is confident that the linking of these agencies to the board will result in great benefits to the country.

The California Highway Department is cooperating in this important work through its laboratory department represented by C. L. McKesson, research engineer.

We should consider this problem from the standpoint of national defense and military preparedness.—*Senator Oddie,* discussing Federal Aid.

Our highways are built by and under the states with such federal participation as is calculated to assure continuity and articulation.—*President Harding.*

As the result of Federal Aid the great highways have been practically nationalized, they have ceased to serve only the community or the states.—*Senator Simmons.*

This is not a subsidy, because every added facility for the transportation of commerce helps to build up the Nation. It means national wealth, national welfare.—*Senator Sterling* on Federal Aid.

THE OLD ORDER CHANGETH

IT USED TO BE, "Let George Do It"; now the wives do it. Recently, when the commission asked for bids for the construction of three bridges on the California Redwood Park road, in Santa Cruz County, the Wilson brothers of St. Helena, Napa County, sent their wives to Sacramento to present their bid and attend the opening.

The Wilson bid proved the lowest received; the contract has been awarded and the work is under way. The new reinforced concrete structures will replace county-built wooden bridges, inadequate for present traffic into the popular park area.

WOMEN BIDDERS—Mrs. W. S. Wilson and Mrs. J. A. Wilson of St. Helena visited the Sacramento headquarters recently and, representing their husbands, submitted the lowest bid for the construction of three bridges in Santa Cruz County. While in the office, they found time to look over the latest issue of California Highways, the commission's monthly bulletin.

WHAT THE DIVISIONS ARE DOING

DIVISION I.

HEADQUARTERS, WILLITS.

T. A. BEDFORD, DIVISION ENGINEER.

Counties of Del Norte, Humboldt, Mendocino, and Lake.

THE DIVISION has just completed the construction of a combined shop and truck shed on the thirteen-acre maintenance station site, recently leased to the state by the board of supervisors of Del Norte County. The building houses both maintenance headquarters for the division and a shop for the equipment department.

Seventeen miles of surfaced roadway along the Redwood highway have been treated with oil as a dust preventive. The results are being commended by residents of communities through which the highway passes and by proprietors of numerous motor camping grounds.

Butterfield and Sears, contractors, have three power shovels operating on their contract for widening and straightening work in northern Mendocino County and splended progress is being made.

Slide Removal Expensive.

To date, more than 170,000 cubic yards of major slides, the result of last winter's rains, have been removed from the Redwood highway and its laterals. The estimate of the work remaining to be done is 75,000 cubic yards. Two P and H gasoline shovels and four Insley-Fordsons are in service in addition to hydraulic monitors, pumps, scrapers and hand labor. The expenditure up to the present for slide removal has been $100,000.

Informal contracts have been awarded by the Commission for the placing of shoulders along the new pavement between Eureka and Arcata. The shoulders will be built up for 2½ feet on either side of the pavement. Hauling and placing of earth embankment will be done by Smith Brothers and the rock surfacing will be furnished by W. S. Elsmore. Both are local contractors. The work is necessary to provide a wider roadbed across the tide flats of Humboldt Bay. The allotment for the work is $25,000.

DIVISION III.

HEADQUARTERS, SACRAMENTO.

F. W. HASELWOOD, ACTING DIVISION ENGINEER.

Counties of Butte, Colusa, El Dorado, Glenn, Nevada, Placer, southern Plumas, Sierra, Sutter, Yuba, and northern Sacramento and Yolo.

ALL of the Truckee River highway is now under contract and construction is starting on the necessary bridges and grading which will open a highway connection with Nevada through the scenic Truckee canyon. This is the most important work under way in the division. Other grading contracts on the same route, in the vicinity of Boca and east of Colfax, will be completed this year. The Forest Service is building a bridge and doing surfacing at the Donner Summit.

Construction of the subways under the tracks of the Western Pacific and Sacramento Northern railroads, at the northern entrance to Sacramento, has been started by Lord and Bishop. Plans are ready for the pavement to be placed between the American River and North Sacramento.

Grading is now under way east of Camino on the contract of Irey and Holden for the improvement of a section of the Placerville route.

Tahoe Highways Improved.

A crew of men with a power shovel is busy continuing the improvement of the state highway in the vicinity of Emerald Bay, Lake Tahoe.

Floors of several bridges on the Eastside highway, in Butte County, have been surfaced with asphalt concrete and a marked improvement is the result.

State forces are about to begin surfacing with asphalt macadam the Auburn-Colfax section, in Placer County.

Crushed rock has been placed on a mile of highway on the Slippery Ford grade, El Dorado County; widening work has been done between Riverton and Kyburz.

A 1000-gallon pressure oiler has been used by the division to place fuel oil on various sections of surfaced mountain roads as a dust preventive, eliminating the necessity for sprinkling. Oil has been tried about Lake Tahoe, and between Placerville and Smith's Flat.

Mountain roads throughout the division are generally reported in good condition.

DIVISION VII.

HEADQUARTERS, LOS ANGELES.

S. V. CORTELYOU, DIVISION ENGINEER.

Counties of Los Angeles, Ventura, Orange, San Diego, and eastern Kern, south of Mojave.

WORK has been begun on the reconstruction of the Whittier boulevard between Montebello and Whittier, Division VII. Kuhn Brothers are the contractors. In cooperation with Los Angeles County, a 56-foot street is being built. Bids have been asked for an additional section of this route between Philadelphia street and Michigan avenue, near Whittier.

Good progress is being made by Jahn and Bressi on the contract for widening and thickening the pavement between San Juan Creek and Galivan, Orange County, on the San Diego trunk line. The same firm has been awarded the contract for similar work north of Oceanside.

The San Onofre-San Mateo Creek line change, in northern San Diego County, also is under way. Grading is being done by R. A. Wattson, contractor, and one of the most dangerous places on the highway system soon will be eliminated.

In the mountains east of San Diego, on the Borderland highway to El Centro, a day labor camp has been established near Pine Valley, where construction of a line change to eliminate several bad curves on a 7 per cent grade is under way. The work is being done in the vicinity of Laguna Summit. The same crew will surface about four miles of earth road with disintegrated granite.

Completion of the removal of several slides in the vicinity of La Jolla Creek is all that remains to be done to complete the Hauser contract, on the Coast boulevard.

DIVISION IX.

HEADQUARTERS, BISHOP.

F. G. SOMNER, DIVISION ENGINEER.

Counties of Inyo, Mono, and eastern Kern County, north of Mojave.

THE commission has approved an informal contract with George H. Clark for surfacing the state highway in Mono County from three miles north of the Devil's Punch Bowl to Tioga Junction.

A MOUNTAIN BRIDGE—Typical bridge construction on a mountain highway in Division X. Timber cut close by is being used to improve conditions on a summer road.

A similar agreement has been made with Harry Wilson for granite and clay surfacing on the east of the Sierra trunk line between Ricardo and Cinco, Kern County. Both jobs will be under way shortly.

A survey has been authorized for the state highway between Mojave and Kramer, Kern County, the county having agreed to grade this section of the Mojave-Barstow route. The work will be done on the line of the state survey.

Barstow Gets Offer.

The commission has agreed to pave a strip twenty feet wide through the town of Barstow, if property owners will pave the balance of the street.

The division has completed repairs to a mile of state highway washed out during the recent cloudburst on the desert in the vicinity of Olancha and Red Rock canyon.

Additional favorable comment is being received from users of the state road across the desert from Mojave to Bishop.

DIVISION X.

HEADQUARTERS, SACRAMENTO.

J. C. McLEOD, DIVISION ENGINEER.

Counties of Amador, Calaveras, Alpine, Tuolumne, Stanislaus, San Joaquin, Solano, and southern Sacramento and Yolo counties.

INTERESTING experiments in the curing of concrete are being made on the shoulder widening work now under way in Yolo County. "Celite" has been used in connection with the work being done by the Kaiser Paving Company, which is now nearing completion. The new superelevated curve at the Winters Wye is now in use.

An industrial railway and a complete new paving outfit are being used by Contractor J. F. Knapp on his reconstruction project in southern San Joaquin County. C. M. Butts is resident engineer in charge for the state. Rapid progress is being made.

Murdoch Contract Extended.

The R. M. Murdoch contract for grading a section of the Alpine highway, immediately east of Jackson, Amador County, has been extended to cover surfacing. C. L. Caine is resident engineer in charge. Murdoch also will crush gravel for use on the San Andreas lateral.

The Leventon and Heintze contract for grading and surfacing on the Rio Vista lateral, between Denverton and Suisun, Solano County, has been completed and accepted.

Repair of the trestle work at the Rio Vista bridge has been completed. Special eucalyptus piling, reinforced with sway bracing, was used.

Repairs to the New Hope Landing bridge, also in the Delta section, are under way.

EQUIPMENT DEPARTMENT NOTES

The commission has approved an expenditure of $6,000 for the enlargement of the office of the headquarters shop, Sacramento, and to do certain necessary street paving.

The new division shop at San Bernardino has been completed and equipped and is now making necessary repairs to automotive and construction equipment of Division VIII. The shop has been placed in charge of Superintendent of Equipment W. D. Cook. Walter H. Riechel has transferred from Sacramento to be stock clerk at the new plant.

BRIDGE DEPARTMENT NEWS

CONSTRUCTION on the San Gabriel River bridge, near Whittier, Los Angeles County, is well under way. Pier excavation and pile driving are in progress and grading of approaches has been completed.

The San Juan Creek bridge, near Capistrano, on the San Diego route, is progressing rapidly. Farther down the coast, work has been begun on the bridges over San Onofre and San Mateo Creeks where a radical line change is being made.

In the northern part of the state, work is starting on the underpasses at the northern entrance to Sacramento; on bridges in the Truckee River canyon, and across the San Joaquin River, at Mossdale.

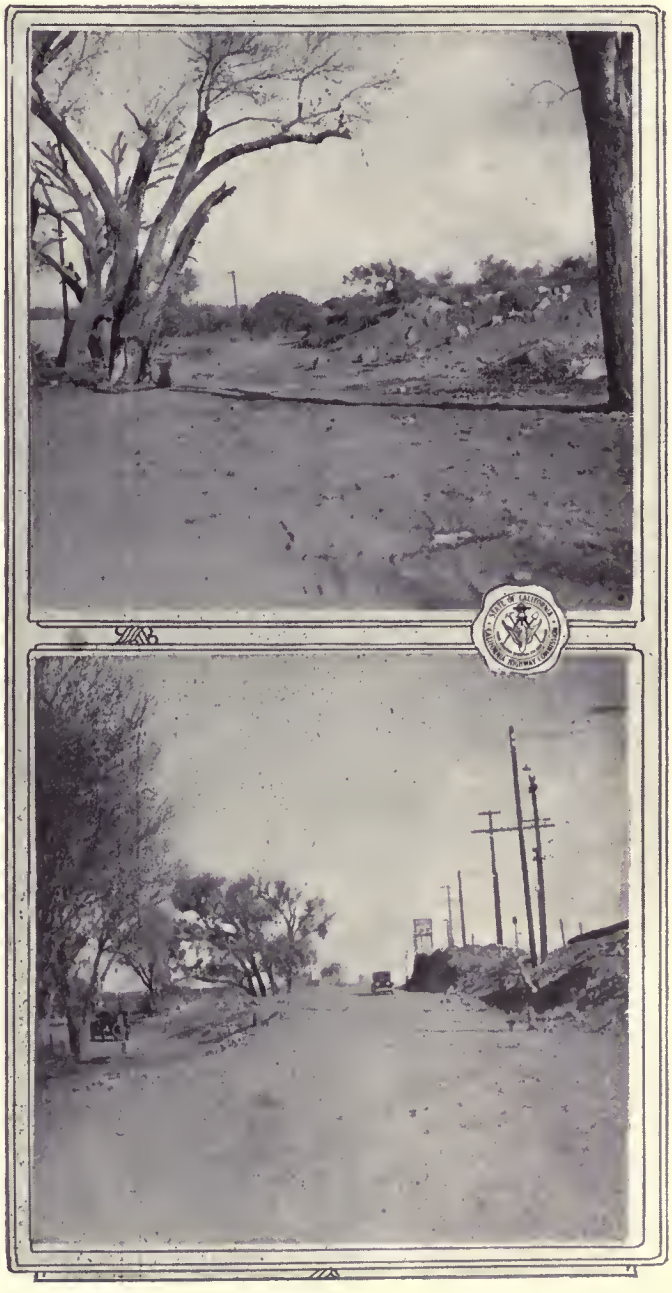
Bids have been asked for the Charlie Creek arch in Shasta County, which will be one of the highest arch type bridges on the state system.

Pismo Work Starts.

Work also is starting on the two bridges at Pismo Beach, which will make possible the closing of the last gap in the Coast trunk highway. A. L. Richardson has been assigned to this contract as resident engineer.

Lord and Bishop, contractors, have completed three bridges east of Susanville in Lassen County, consisting of a 35-foot concrete structure over Robbers Creek, and combination wood and concrete trestles over Baxter Creek and Long Valley Creek, 90 feet and 150 feet long, respectively.

W. E. Whitney will be resident engineer on the construction of three concrete structures on the California Redwood Park road in Santa Cruz County.



IMPROVEMENTS ON THE NATIONAL OLD TRAILS, SAN BERNARDINO COUNTY—Above, old county road near Oro Grande, between Victorville and Barstow; below, recently completed state highway grade, same point. This improvement was financed with state highway funds.

STATE HIGHWAY FUND CONTRACTS (Bond Funds, Including Federal Aid)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE JUNE 3, 1925.						
450	II	Lassen	29	A-C-E	Robbers, Baxter and Long Valley Creeks		Three Bridges	Lord and Bishop	$21,967 88	Aug. 22, 1924	
453	VI	Kern	57	E	Across Cottonwood Creek		R.C. Bridge	J. L. Webster	32,962 50	Sept. 22, 1924	
455	X	Solano	53	A	2 miles east of Suisun to Denverton	6.91	24 ft. grading	Leveoton and Heintze	32,000 00	Sept. 22, 1924	
462	VI	Madera	4	C	Across Chowchilla River		R.C. Girder Bridge	Proctor and Cleghorn	13,348 13	Dec. 13, 1924	
					AWARDED SINCE JUNE 3, 1925.						
469	III	Nevada	38	B	Across Southern Pacific Railroad at Hinton		R.C. Girder Bridge	T. H. and M. C. Polk	21,178 13	June 17, 1925	150
470	III	Nevada	38	A	Across Truckee River at Prosser Creek		R.C. Girder Bridge	T. H. and M. C. Polk	25,981 88	June 17, 1925	150
471	III	Nevada	38	A	Across Truckee River near Boca		R.C. Bridge	Rocca and Caletti	33,964 88	June 17, 1925	150
472	II	Tehama	7	A	Through Corning	1.00	P.C. Concrete Pavement	E. A. Burns	41,537 48	June 17, 1925	75
473	V	San Luis Obispo	2	E	At Pismo Crossing		Bridge	J. L. Webster	50,401 69	June 17, 1925	175
474	III	Nevada-Sierra	38	B-A	Floriston to Nevada State Line	5.96	Grading	Nevada Contracting Co.	311,321 25	June 17, 1925	250
475	VIII	Imperial	27	C	El Centro to Holtville	8.57	Grade and Gravel	S. Y. Faucett	129,262 65	July 13, 1925	225
					Sub-total	15.53			$613,647 96		
					PENDING AWARD—None.						
					Total State Highway Fund Jobs Awarded and Pending Award	15.53			$613,647 96		

NOTE—Primary construction covered by the above contracts does not include funds obligated on cooperative forest highway projects, prison road camp activities, or day labor jobs not being done under contract.

STATE HIGHWAY MAINTENANCE FUND CONTRACTS (Including Gasoline Tax Fund)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE JUNE 3, 1925. None						
					AWARDED SINCE JUNE 3, 1925.						
M-86	V	Mooterey	2	H-I	1 mile north of Bradley to San Ardo	12.10	Rock Borders	Fred Nighbert	39,600 00	June 17, 1925	80
M-87	V	Monterey	2	G	San Ardo to San Lucas	11.00	Rock Borders	Fred Nighbert	34,880 63	June 17, 1925	75
M-88	VI	Merced	32	C	6 miles east of Los Banos to San Joaquin River	10.00	Rock Borders	Kaiser Paving Co.	26,289 00	June 17, 1925	75
M-89	III	Placer	39	A	Tahoe City to Nevada State Lioe	11.60	Crushed Stone Surface	Bishop and Brooks	26,901 00	June 17, 1925	75
M-90	IV	Sonoma	1	B	Healdsburg to Mark West Creek	8.79	P.C. Concrete Pavement	Galbraith & Jaoes	314,414 82	June 17, 1925	150
M-91	IV	Santa Cruz	44	A	Across High Bridge Creek		Bridge	A. J. and W. S. Wilsoo Co.	14,629 50	July 13, 1925	100
M-92	VII	Los Angeles	9	A	Sunland to La Canada	8.14	P.C. Concrete Shoulders	Dewey and Rawsoo	74,499 84	July 13, 1925	125
M-93	VII	San Diego	2	C-D	Oceanside to San Ooofre	13.10	P.C. Pavement and Shoulders	Jahn and Bressi	364,381 31	July 13, 1925	200
					Sub-total	74.73			$895,596 10		
					PENDING AWARD.						
----	VI	Fresno	----	----	Fresno	----	Maintenance Shops and Truck Shed		$32,953 50		
					Total State Highway Maintenance Fund Jobs Awarded and Pending Award	74.73			$928,549 60		

NOTE—The above obligations charged against the State Highway Maintenance Funds do not include funds from these sources obligated for general maintenance and for specific betterments not being done under contract.

HIGHWAY NEWS NOTES

A conference of division engineers and head of departments from headquarters will be held in Los Angeles, July 21, 22, and 23. Work under way in the south will be inspected and on the final day of the conference a joint session will be held with the County Surveyors' and Engineers' Association of the state.

F. C. Silson of the Division VII staff, has resigned to accept a position with a Hollywood development company.

Captain Charles R. Blood, of the maintenance department, and Captain E. J. Murray, of the bridge department, were among the officers attending the National Guard Encampment at Del Monte. Other highway employees at the camp were Sergeant Claude S. Simpson, and R. S. Badger. A letter from Simpson reported the "eats" excellent and the boys working hard.

Friends Surprise Mrs. Barrett.

Mrs. Fay Barrett, who recently gave up her position as stenographer after seven years in the service of the commission, was presented with a handsome silver flower bowl by her friends at headquarters, upon the occasion of her leaving Sacramento for a vacation in the mountains.

F. R. Baker, resident engineer, Division III, has recovered from a severe illness, and, during the month, had charge of placing of an asphalt floor on several bridges in Butte County.

Members of the commission and State Highway Engineer R. M. Morton recently made an inspection trip over highways in Divisions I and II, going as far north as the Oregon line.

Division VIII News.

L. T. Norlen has left the drafting room to take a position as maintenance foreman under Assistant Maintenance Engineer J. E. Stanton.

Miss Annie L. Nelson, stenographer, has transferred from the Industrial Accident Commission to Division VIII.

Those who have been complaining about the warm weather of recent weeks should consider Division VIII. Sullivan reports the temperature on the desert hovering between 120 and 130 degrees for several days.

Engineer Returns From East.

Assistant Division Engineer R. E. Pierce studied activities of Divisions VII and VIII on his way home from the New Orleans convention of the American Association of Engineers, where he represented the Sacramento chapter.

C. M. Butts, resident engineer, Division X, spent his vacation building a cabin on his forest service lease near Kyburz, on the Placerville route to Lake Tahoe. Jess W. Cole is again employed by Division X.

Arthur E. Shaffer, attached to the equipment department in Division I, recently took unto himself a wife, in the person of Miss Carrol Stewart of Sacramento.

While the remainder of the state has sweltered, Frank Symns, resident mechanic at the Smith River convict camp, has been in high spirits over four consecutive days of sunshine.

Miss Hellen Hendrickson, clerk in the headquarters shop, was presented by the office force with a handsome floor lamp upon the occasion of her recent marriage. She is now known as Mrs. Molander.

Paul Dunkhorst and family are spending their vacation in the American River canyon.

EXAMINATIONS SCHEDULED

For the purpose of renewing eligible lists for engineering draftsmen and civil engineers, the State Civil Service Commission announces examinations for these positions will be held in the fall, probably during the month of October.

Persons interested may obtain further information by applying to the headquarters of the commission, room 333 Forum Building, Sacramento.

Lesson Well Learned.

"Hello, the club? Is my husband there? Not there, you say? But wait—I haven't even told you my name."

"Say, lady! There ain't nobody's husband here never!" was the darky's reply.—*The Northern.*

PRISONER FACING RELEASE FROM KERN RIVER CAMP WRITES LETTER GIVING IMPRESSIONS OF SYSTEM

WHAT DO MEN in the road camps think of the California plan for using prison labor in highway construction, is a question often asked those in charge of this branch of the Commission's activities. The following letter, received by Superintendent Ben H. Milliken from a man who was then about to be released from the Kern River camp, will be of interest to all students of California's penal system. It is evident the writer has given the subject intelligent thought.

He writes as follows:

BEN H. MILLIKEN, ESQ.,
Superintendent of Prison Road Camps,
Sacramento, Cal.

DEAR SIR: Now that I am, so to speak, on the threshold of my departure from the custody of the California state prison at Folsom, and ready again to resume my battle with life, it is but natural that my thoughts should turn to the future rather than to the past, which has not been altogether bitter.

From every indication at present, I have nothing but good fortune to look forward to in the year to come, and in the years which are to follow, and I can honestly say in all sincerity, that never before since I left college have I felt so optimistic about the future, nor felt so well fortified to combat the vicissitudes of life. While that may sound like an unusual statement from a man emerging from the gates of prison, when one analyses it carefully, as well as the character of the writer, he will be obliged to admit that California's penal system is *not* a failure, and that the work of the California Highway Commission in its rehabilitation program to build character as well as roads, is one of the most beneficial and Christianlike works ever attempted in the many years of reform.

I feel that my opportunity in life today is due nearly 100 per cent to the kindness and efficiency of the *California Highway Commission,* and I only hope and pray that some day, in my humble way, I will be able to repay them in some small part for all that they have done for me as well as thousands of others. It is rather difficult for a man in a position similar to mine to realize that what he finds rather irksome and perhaps even unpleasant is for his own good; but nevertheless, it is the truth and I thank God that my eyes are open and I am capable of discerning the truth of the statement that honest productive work under favorable conditions is the universal panacea for illness of mind as well as body.

The sum of money I have earned through employment on the highway has given me financial independence for a time at least. The opportunity of being self-supporting has enabled me to retain my self-respect and has brought home, better than millions of sermons, the value of work as an antidote to crime.

Therefore in conclusion, now that my time is nearly spent, and I expect and ask for no more favors, I can truthfully say to you, Mr. Milliken, Mr. Julian H. Alco and Mr. Ralph W. Brown, that, one man at least, will leave this highway camp with his heart filled with happiness at the privilege he has enjoyed and a full determination and resolve to prove that Mr. Alco's theory is an established fact, by making an honest and useful living for myself.

Most sincerely and gratefully,

(Signed) ----------.

The writer has now returned to civil life and is filling a responsible position. His name for this reason is withheld.

Stalled.

Bus Conductor—"One seat on top, ma'am, and one inside."

Lady—"You surely wouldn't separate a mother from her daughter."

Conductor (ringing bell)—"Never again, lady. I did it once and I have regretted it ever since!"—*Humorist* (London).

The above map shows the federal aid highway system of California in its relation to other state highways. The roads shown on this map constitute the present state highway system, except in one or two minor particulars where the federal aid system includes short sections not designated state highways.

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CALIFORNIA HIGHWAYS

A BULLETIN ISSUED BY THE CALIFORNIA HIGHWAY COMMISSION FOR THE INFORMATION OF ITS EMPLOYEES AND THE PUBLIC

Vol. 2 AUGUST, 1925 No. 8

VENTURA SEAWALL UNDER CONSTRUCTION—Building of the great seawall, near El Rincon, Ventura County, on the Coast route, is progressing steadily under direction of the Bridge Department. *Upper left*, general view of scene of construction and the old wooden causeway, which will be eliminated when the wall and fill are finished. *Upper right*, section of the wall; dotted line shows ultimate height of fill upon which the pavement will be placed. Other views show sections of wall as it looks today. See article on page seven. (Bridge Department Photos.)

CALIFORNIA STATE FAIR, SACRAMENTO, SEPTEMBER 5th to 13th, INCLUSIVE

OCT 7 1925

CALIFORNIA HIGHWAYS

HARVEY M. TOY, Chairman;
N. T. EDWARDS and LOUIS EVERDING, Commissioners.

ROBERT M. MORTON, State Highway Engineer.

W. F. MIXON, Secretary.

We are pleased to permit publication of any of the matter contained herein or to loan cuts and this privilege is extended newspapers and periodicals without restrictions.

FRANK B. DURKEE - - - Editor
P. O. Box 1103, Sacramento, California.

Vol. 2. AUGUST, 1925. No. 8

CALIFORNIA HIGHWAY DEPARTMENT

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J. B. WOODSON, Division VI, Fresno
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F. G. SOMNER, Division IX, Bishop
J. C. McLEOD, Division X, Sacramento

General Headquarters, Fifth Floor, Forum Building, Sacramento

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THE COMING BATTLE

THE West and the awakened South, sections of the country which seem most appreciative of federal aid in highway construction, must prepare for a determined effort in its behalf if the present policy of the national government is to be continued. In the East, federal aid is being attacked as paternalistic and an invasion of state's rights.

In these more or less academic questions the West has little interest. Its demand for federal aid is based on altogether different grounds.

Under the heading, "Federal Aid Misjudged," *Western Highways Builder,* Los Angeles, has this to say:

> With the paternalistic aspects of federal aid, the west is little concerned. Much may be said in its defense. The theory of administration of a quasi-socialistic democracy such as these United States has always recognized the justice of demanding that the richer sections of the nation must contribute to the poorer sections for works benefiting the nation as a whole, on the basis of their ability to pay rather than on proportionate benefits derived from the improvement.
>
> But the west is not interested in such abstract theories. The vices and virtues of paternalism may be discussed *ad infinitum;* we shall cling to the demand for a much more simple justice. So long as the federal government pursues the policy of withholding vast areas of the public domain as reserved territory, unimproved and tax free, we must insist that compensation be made to the states wherein these lands are situated. The public lands of the western states are as much the property of New York, Massachusetts, Pennsylvania and those other far eastern commonwealths as they are, say, of Nevada, Idaho, Arizona or Montana, and the periodical assaults on the federal aid plan—the only compensative scheme yet promulgated to aid the west—emanating in the far east must be sedulously resisted else the west may find itself land-throttled, paying tribute to an absent landlord who denies any obligations to his tenants.

The measure of a nation's civilization, its advancement in education and in material things, can to a large extent be judged by the condition of its highways. Here and there some genius may rise above his surroundings and become a great leader though born amid the dirt and squalor which are usually associated with impassable mud roads or bottomless sand roads. But, broadly speaking, a people can rise no higher than the condition of their highways.—*Manufacturers' Record.*

AUGUST 1925 | California Highways | VOL. 2 NO. 8

LABORATORY TAKES GUESS WORK OUT OF HIGHWAY BUILDING

RESULTS OF RECENT RESEARCH DISCUSSED AT ENGINEERS' CONFERENCE

(From a report prepared by C. S. POPE, Construction Engineer.)

THE RESEARCH laboratories of the several states, working in cooperation with the National Research Council and the United States Bureau of Public Roads, are rapidly taking the guesswork out of highway construction. Great strides in this direction have been made in the last few years, and in this work the research laboratory of the California Highway Commission, which is under the jurisdiction of the construction department, has had an important part.

Today, laboratory and field control of highway construction in California is complete. Material of every kind entering into state pavements—the rock, sand, cement, water, asphalt, steel reinforcing, metal pipes—must undergo the most searching chemical and strength tests at the laboratory, as well as the necessary controls during construction. Before the pavement is laid the subbase has been examined, and daily tests are made and samples taken as the work progresses. Nothing escapes the searching eyes of the laboratory staff and the men in the field, who see to it that all work conforms to the standards and methods fixed by the construction department. Stronger and better pavements are the result.

Construction Department Presents Program.

At the recent conference in Los Angeles of the engineering staff of the commission, to which the county engineers were invited, information obtained as a result of recent laboratory investigations was presented by the construction department and discussed by Research Engineer C. L. McKesson, aided by stereopticon projections.

Probably the most important of the subjects presented was, "Finishing and Curing of Concrete," a paper read by Mr. McKesson at the recent meeting, in Salt Lake City, of the American Society of Civil Engineers. It is based upon the cooperative tests conducted in Sacramento by the California Highway Commission and the Lewis Institute of Chicago.

The presentation at the Los Angeles conference is altogether too voluminous for publication, in full, in the bulletin. Mr. C. S. Pope, construction engineer, under whose general direction the research work is being done, has prepared the following summary of the subjects investigated and the conclusions reached:

Finishing and Curing Concrete.

The deductions to be drawn from Mr. McKesson's paper on "Finishing and Curing Concrete," related more particularly to curing. It seems probable from the experiments conducted at the laboratory that the following deductions may be drawn:

The critical time of watering concrete for proper curing is within the first three or four days. It is probable the time of watering may be cut to possibly seven days, instead of fourteen days as practiced at present; the additional protective period to be seven days, or fourteen days in all from the time the pavement is placed until it may be opened to traffic.

The advantage of such decrease of curing period will be apparent when it is considered it will reduce the time during which the road is out of service by one-third and correspondingly decrease cost of curing and maintenance of detours.

Calcium Chloride Curing.

Other points brought out were that, while calcium chloride offers substitute method of curing concrete pavements, it is not as efficient in California as the standard ponding method and should be resorted to only when shortage of water does not permit the use of usual methods.

Other matters covered in this paper, it is expected, will be released in the near future by the Lewis Institute.

Mixing Time Studies.

These studies included a determination of the effect of mixing time on the strength of concrete cast in cylinders. The results indicate mixer manufacturers have properly rated their mixers to do efficient work at one minute mixing time, and that a two minute mixing period does not give an appreciable increase in strength, although mixing times at three, four, and five minutes undoubtedly do give a slight increase in strength.

Soil Analysis.

Methods of soil determination were discussed. The conclusion reached was that two simple methods of analysis are all that are necessary for determination of the quality of soil and the probable results of its use in subgrades. The first of these is shrinkage, which is determined by making up the soil in moulded bars of a proper consistency to obtain the lineal shrinkage when dried to constant weight.

The second is the determination of moisture equivalent of soil, that is, the quantity of water which various soils will absorb under certain methods of manipulation. Heretofore, in making the moisture equivalent test, it has been necessary to employ laboratory methods, but recent investigations by the Bureau of Public Roads, which are confirmed by our laboratory, show these tests may be made in the field. A simple apparatus, consisting only of a bowl and spoon with proper weighing devices, is all that is necessary. This method of determining moisture equivalent is known as the Rose Method.

Subgrade Materials.

The methods used in California for sampling and making an analysis of subgrades were presented. The construction department analyzes subgrades and if any are found unsuitable, necessary measures are taken to protect pavements against adverse soil.

The importance of a proper method of sampling for alkali was emphasized. It was demonstrated a skimming only should be taken, since alkaline soils, if sampled to a depth greater than two or three inches, will not give an indication of the extreme concentration of alkali, which takes place at the surface, and which is so destructive to concrete paving.

Sand Grading Studies.

A discussion of the studies made in connection with the grading and strengths of sand, as used in concrete mortar throughout the

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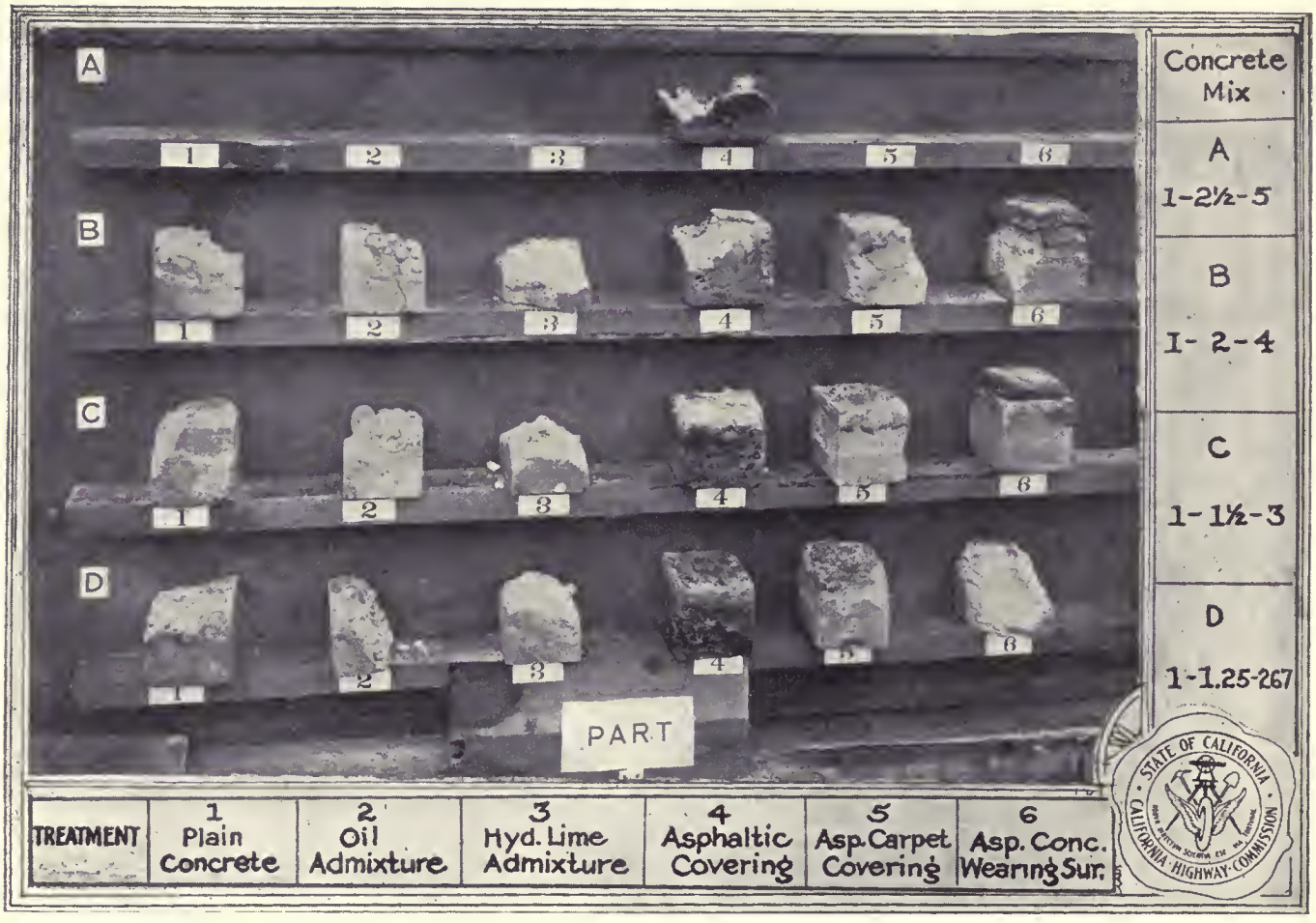


WHAT ALKALI DOES TO PAVEMENTS—Cubes of concrete buried for a period of forty-four months in a sample of alkali soil secured along the highway in one of the desert sections of the state. Similar experiments have been made with alkali soils from other sections. Results of these tests demonstrate to engineers necessity for protecting pavements against contact with subbase soils containing alkali. It is believed failure of some original California pavements undoubtedly was due to this cause. Research engineers are endeavoring to find means of overcoming alkali.

LABORATORY TESTS DISCUSSED

(Continued from page 3.)

state, was given together with slides showing the curves obtained by platting the gradings of sand on diagrams. The studies included tests on some 450 different sources of supply in the state, covering various divisions of the highway organization. The tests show that good concrete sands exist in practically every section of the state, with the exception of two coast counties. The increase in strength of concrete, obtainable by proper grading of sands of suitable structural strength, was brought out by means of trial gradings.

Factors in Concrete Strength.

Tests of concrete, using different cements, sands and quantity of mixing water, indicated the factors entering into concrete strength are in the following order:

1. The amount of mixing water;
2. Grading of sand;
3. Strength of individual cement and,
4. The coarse aggregate.

Strength of Cement.

Charts were shown giving the results of tests of different brands of cement in use in California. These tests were conducted by the California Highway Commission, the Bureau of Public Roads, and the Washington State Highway Commission, in a joint series, to determine the variation of strength in the different brands. This study is of considerable value to the cement companies, because it gives them the rating of their product as compared with other producers. The continuation of these studies will tend to produce a uniformity in the strength of California cements.

At the present time, the standard requirements of the State Highway Department are met by all of the California plants. But there is a considerable difference in the actual strength of concrete obtained by using the different brands.

Early Strength Studies.

The purpose of these studies was the development of an early strength concrete for use in repair work and patching. Tests of a new cement containing a high aluminum content were reported upon, as were tests of standard cement using seven and eight sacks to the cubic yard, instead of six sacks, the California standard. The Lumnite cements show compressive strength exceeding 5000 pounds in twenty-four hours, but their cost is so great that only in emergency cases can they be used.

It was brought out that a suitable strength probably could be developed with the ordinary cements, if a sufficient amount were used, and that it would be possible to open patches with safety within three or four days.

Permeability Studies.

This report covered the results of experiments using various impermeable cements or admixtures to secure waterproofing. A number of cements produced in California, and used for waterproofing, were tried as well as a number of admixtures. It was found that vessels, made from standard cements in which the quantity was increased slightly over the usual amount and the con-

crete made as dense as possible, gave the best results as to impermeability. In making the test, cylindrical jars of the different mixtures were cast, and as soon as cured, were filled with water and sealed with paraffine. They were then kept at a constant temperature, and in a uniform state of humidity for a number of weeks. The jars were weighed at stated intervals during this period to determine the loss of water by evaporation through the walls.

Test of Road Gravel.

Tests recently devised by the Testing and Research Laboratory in connection with the examination of road gravels were discussed under this heading. The method employed reduces road gravels to a material, all of which will pass a one-half-inch screen and fifteen per cent of which will pass a Number ten. The latter fifteen per cent consists of more or less dust and finer material. The whole mass is then wet to a proper consistency and cast in a mould four and one-half inches square by nine inches long. After being dried to constant weight, these prisms are crushed to determine their cementing value. This test, in addition to the usual test for hardness, indicates the value of the gravel for road purposes.

Effect of Alkali on Concrete.

Some four years ago, the state began a series of tests, which recently have been completed, to determine the effect of alkali on concrete pavements. A study of the condition of test blocks of concrete after remaining in samples of alkaline soil for forty-four months, resulted in the following conclusions:

(a) Asphaltic paint coats or surfaces provide protection to concrete subjected to action of alkali;

(b) Concrete, rich in cement and relatively dense, resists action of alkali better than more porous concretes;

(c) Necessity for insulating against alkali was clearly demonstrated, as many of the experimental blocks, subjected to intense action, were entirely destroyed.

Standardizing Sieve Sizes.

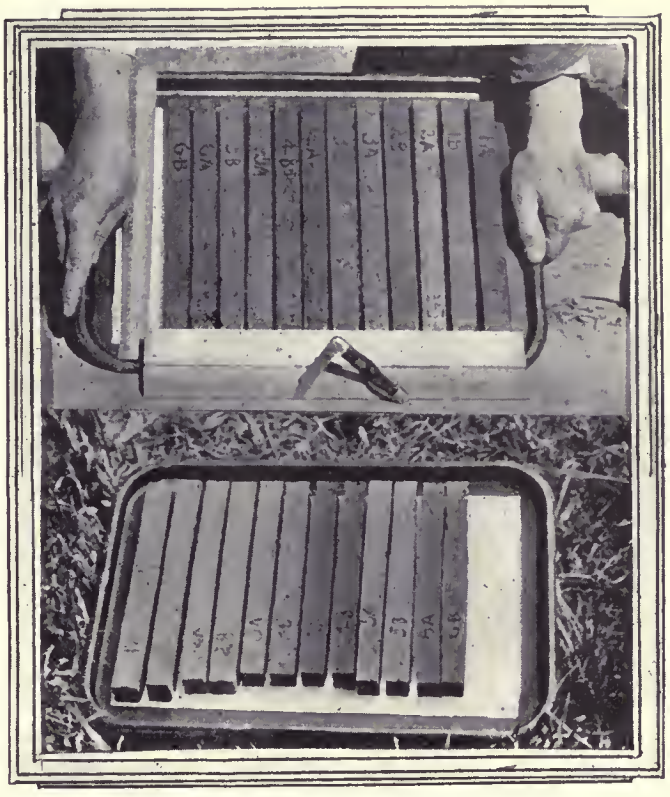
The results of a conference with southern California manufacturers of stone and gravel were reported. At this conference, participated in by leading producers of stone and gravel in southern California, engineers of the city and of the county of Los Angeles, as well as engineers in private practice, an agreement was reached upon the size of stone to be specified on work in the southern part of the state. Standard screen sizes were adopted.

The rock companies also agreed to conform to the gradings for sand and stone fixed by the specifications of the California Highway Commission. The agreement is considered most satisfactory, as it will decrease the number of screen sizes which the companies might have been required to use, because of different specifications by different engineers. It will make possible a great saving in the construction of screens and also in the stockpiling of materials.

Asphaltic Surfacing.

In connection with other matters, a short, incidental discussion of asphaltic surfacing took place. The most important factors brought out were the reduction in the amount of asphalt in asphaltic concrete work, due to improved grading of materials; the larger mixers in use, which materially cheapen the work; use of the spreader box, now a California standard. The spreader box materially reduces the cost of placing this type of pavement.

The omission of a seal coat on recent California highway work was discussed briefly, as were a number of proposed improvements in the quantity of filler used, and character of asphaltic cement.



DETERMINING SHRINKAGE OF SOILS—A simple method of determining the shrinkage of soils. *Above,* moulded bars of earth mixed with water to their moisture equivalent content. *Below,* shrinkage evident after being dried to constant weight. Soils that hold a large amount of water in winter and shrink in summer do not make good subbase for pavements and must be guarded against. (United States Bureau of Public Roads tests.)

Vialog Tests.

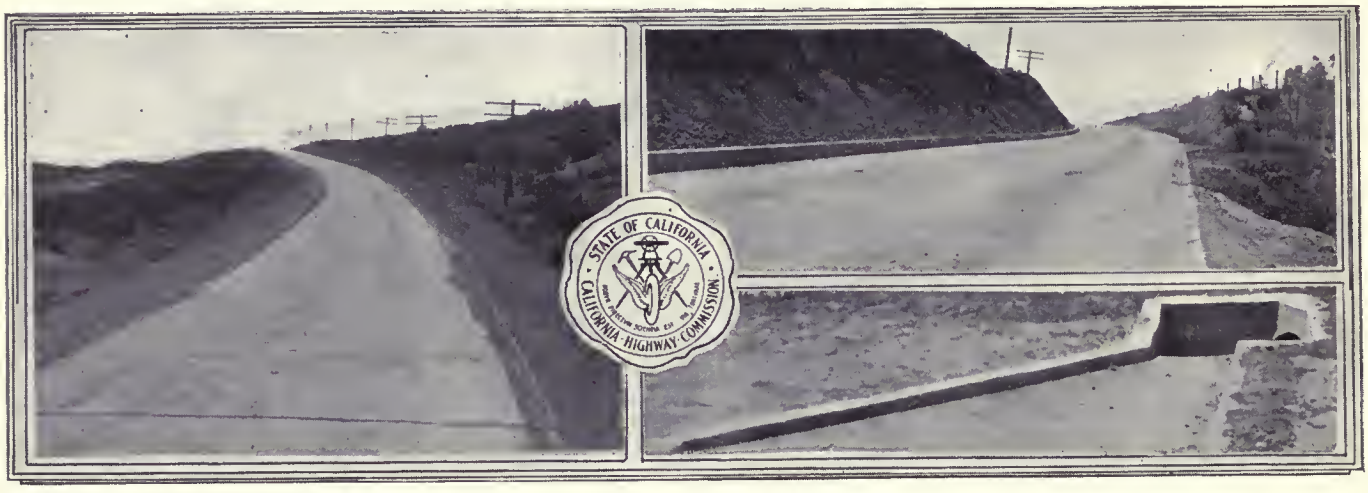
Use of the vialog for testing the smoothness of concrete and other pavements was described. This machine is attached to an automobile and registers automatically the number of units of roughness per mile in the pavement surface.

While the present machine is subject to criticism, in that different results will be obtained by different operators and at

(Continued on page 6.)

ALKALI SOIL TESTS—The above illustrates method used in studying destructive qualities of alkali soils. The concrete blocks were buried in the soil for a period of forty-four months and then removed to observe the results, as shown on page four.

REDLANDS AND BEAUMONT CELEBRATE PAVEMENT OPENING



ANOTHER GAP CLOSED—Views of new section of twenty-foot concrete pavement recently opened to traffic between Redlands and Beaumont, Riverside County. It closes an unpaved gap in the Imperial Valley trunk highway. The views show the curb and gutter design, used in cuts to prevent washing of shoulders. *Lower right,* a gutter leading to a slope drain, constructed to prevent erosion of the fill. (Photos by Division VIII.)

REDLANDS and Beaumont joined several weeks ago in celebrating the completion of 7.1 miles of new pavement, connecting the two cities and eliminating one of the last unpaved gaps between San Bernardino and Imperial Valley, to a point near Westmoreland.

The commission ordered the work done months ago as a part of its program to close gaps in the trunk lines wherever possible. The work was financed from the second state highway fund which had been replenished with federal aid.

Construction Features.

Except for a few slight line and grade corrections the subgrade followed closely the surface of the grade built in 1920.

The pavement is concrete, twenty feet wide and six inches thick, increasing in thickness from six to nine inches, in the outer three feet. It was struck off and tamped with a Lakewood tamping machine running on 3-inch by 10-inch timber headers and finished with a longitudinal float and belt. Careful supervision of the finish was maintained and it is believed a vialog test of the road will show an exceedingly smooth finish.

Expansion Joints Used.

A center joint was placed the entire length of the contract. The joint consisted of 1-inch by 5-inch by 10-foot pine boards toe nailed to the subgrade with 40d spikes, and held together at the abutting ends by strips of tin nailed to the upper edges.

Careful control was maintained in proportioning of materials. The batch truck system was used, all batches being proportioned at the plant on the railroad siding at Beaumont. The coarse aggregate was measured in two sizes to obtain the proper grading.

In addition to paving, culverts were extended where necessary. Curbs were constructed along the edge through cuts, and gutters leading to slope drains were provided where necessary to avoid erosion of the fills.

Basich Brothers of Los Angeles were the contractors. R. L. Young was resident engineer.

LABORATORY TESTS DISCUSSED

(Continued from page five.)

different speeds, it, nevertheless, is the opinion of the department that, when operated under uniform conditions, it has considerable value in determining the relative smoothness of pavements. Particular stress, however, was laid on the fact that it must be operated in the same manner at all times. The results should be considered as pertaining only to the particular machine used.

Ball Indentation Test.

This test consists in forcing a steel ball one-half inch in diameter into concrete pavements to a depth of one-quarter inch. It is an application of the Brinell test. When carefully made, it appears to be of value in determining the hardness of the pavement surface. A great many tests have been made by the California Highway Commission on pavement samples, in connection with other investigations. A discussion of the subject will be found in the publication to be issued by the Lewis Institute. The indentation, generally speaking, varies with the strength of the concrete, and with the method of curing the surface. It was found, for instance, that surfaces cured with water gave a higher indentation test than those cured with calcium chloride.

EGYPTIAN ENGINEERS STUDY CALIFORNIA HIGHWAY METHODS

FROM the far off valley of the Nile have come M. Hassaan and Halim Abdel Malek, engineers of the Egyptian highway department, to study highway building as exemplified by California construction practices. After some time spent in Washington, D. C., as the guests of the United States Bureau of Public Roads, the bureau recommended that they inspect California state highways, as typical of American road building.

The visiting engineers, after spending several weeks inspecting various construction projects in the vicinity of Sacramento, are now employed without compensation in Divisions IV and VII to obtain a more practical working knowledge of the California way of building roads.

California state highways, during recent years, have attracted engineers from many parts of the world, who come here to study the engineering features of the state's road system.

C. S. Pope, construction engineer, reports the highway on Route 16, Hopland to Lakeport, in excellent condition and wishes to commend the maintenance foreman in charge.

VENTURA SEAWALL TESTS SHOW HIGH QUALITY CONCRETE

By Harlan D. Miller, Bridge Engineer.

THE spectacular concrete seawall, more than a mile in length, under construction by the California Highway Commission along the ocean front at the foot of the famous Rincon cliffs, on the Coast highway, in Ventura County, is now well under way. Tests of concrete already placed indicate exceptionally high quality, with a compressive strength, in some instances, as high as 5680 pounds per square inch.

The total length of the Rincon wall will be about a mile and a quarter; its average height twenty feet. It is so located with relation to the cliffs and paralleling tracks of the Southern Pacific railroad, that it will retain a sand fill forty feet in width, upon which will be placed a pavement with a width of twenty-six feet. This will provide parking space, in addition to a twenty-foot roadway. There also will be a six-foot sidewalk, inside the rail.

About one-half of the seawall proper has been completed. Placing of the sand fill, which will be done with a suction dredge working off the beach, has not yet been undertaken.

Built to Resist Wave Action.

The seaward face of the wall has been curved to better resist wave action; and, for the same reason, the parapet, which also acts as a rail for the sidewalk, has been made solid with the outer face curved, as shown in the front cover illustrations.

Particular care has been taken in planning construction of this wall to assure an impervious concrete. Necessary rock crushing and mixing plants have been designed to produce a strong, dense product, of a quality that will withstand action of sea water.

Tests made of concrete already placed have shown a compressive strength as high as 5680 pounds per square inch. The average for ninety-day tests is 5053 pounds.

The old pile trestles, soon to be a thing of the past, were built a number of years ago by citizens of Ventura County, the work being financed largely by private subscription. Under the circumstances, they were constructed as cheaply as possible and are now altogether inadequate to handle the traffic on this important trunk highway.

A Gas Tax Job.

The passage in 1923 of the gasoline tax act provided the funds which have made construction of the seawall possible at this time.

The J. H. Tillman Company, of Portland, Oregon, is the contractor. The cost of the project, when completed, will be approximately $500,000. C. O. Dingle is resident engineer for the state.

DINGLE'S VERSION OF TEMBLOR

On the morning of June 29, near the Rincon seawall between Santa Barbara and Ventura, as we were about to sit down to breakfast, suddenly we were surprised to find the house rocking gently. When the stove and furniture began to sway and the house creak and groan as though it would leave its foundation, we made a rapid exit. There was no doubt the earth was on a rampage. Great clouds of dust hovered over the highway and ocean near the shorter causeway, due to landslides. The slides continued during the day with each shock.

Work on the seawall was not delayed in any way because of the earthquake as there was no damage to either the contractor's equipment or the wall. In one way the earthquake was of great benefit to the contractor. It replenished his depleted water supply, which was from a small creek near the large causeway. He now has more water than is needed. Another stream near his concrete mixing plant, which before the earthquake was dry, is now flowing.

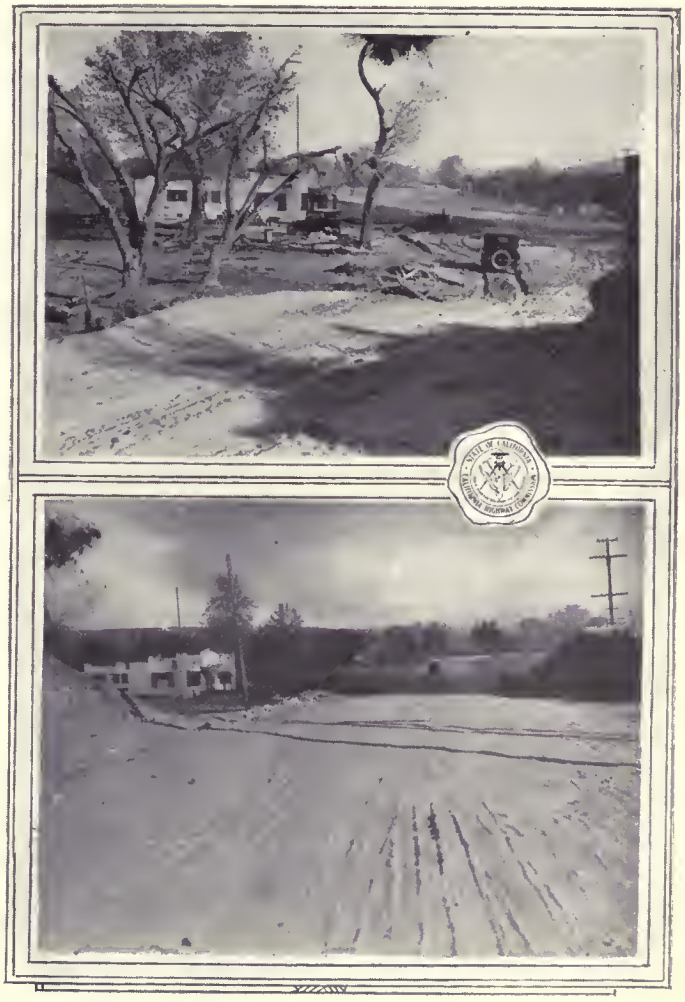
Due to the crowds of motorists going to Santa Barbara to see the results of the earthquake, the highway has been taxed to its capacity.

It is gratifying to know that the seawall had sufficient strength to withstand such a severe test.

RESEARCH MEETING IN DECEMBER

AT A RECENT meeting of the Executive Committee of the Highway Research Board of the National Research Council, it was decided to hold the Fifth Annual Meeting of the board at Washington, D. C., December 3 and 4, 1925. Progress reports received from the chairmen of the research committees indicate they are conducting important studies on almost every phase of highway development, including finance, design, construction and maintenance, thus assuring a successful annual meeting. The program for the meeting is now being prepared and will soon be announced.

Consider the fish; he never gets caught as long as he keeps his mouth shut.



ON THE NATIONAL OLD TRAILS—Before and after views near Oro Grande, San Bernardino County, showing improvements made by the grading of the state highway. This work was completed during recent months.

SAN JOAQUIN FARMERS PAY FINES FOR FLOODING HIGHWAY

MAINTENANCE SUPERINTENDENT TAKES ACTION TO PROTECT PUBLIC

THE DUTY of the California Highway Commission includes the protection of the highways from damage; it does not end with construction.

Where it can be avoided, representatives of the department are reluctant to take drastic measures against offenders, but the recent flooding of the state highway in San Joaquin County demanded action which resulted in two farmers each paying a fine of $50 in the justice court at Stockton.

The occasion serves to draw attention to the fact that the negligent, malicious or wilful flooding of a state highway, or other wilful damage, is a misdemeanor, and that the law will uphold the Commission in action to protect the highways, and the rights of the traveling public.

What the Law Says.

Section 588 of the Penal Code, enacted in 1921, provides as follows:

> Digging up or flooding highway. Every person who negligently, wilfully or maliciously digs up, removes, displaces, breaks down, or otherwise injures or destroys any state or other public highway or bridge, or any private way, laid out by authority of law, or bridge upon any such highway or private way, or who negligently, wilfully or maliciously drains, diverts, or in any manner permits by seepage, overflow or otherwise, any waters thereinto or thereon from lands lying adjacent to or in the vicinity of any such state or other public highway or bridge or private way, shall be guilty of a misdemeanor.

Under this section, C. Bovey, Maintenance Superintendent in the vicinity of Stockton, Division X, swore to complaints against two dairymen who had permitted irrigation water to flood the state highway in the vicinity of Turner Station. The fines were imposed by Justice of the Peace A. C. Parker after Ira B. Langdon, an attorney of Stockton, and a good roads advocate, had voluntarily appeared as special counsel upon behalf of the Highway Commission. The accused dairymen pleaded guilty when confronted by the facts in the case, which are explained by Bovey as follows:

The irrigation of the tract of land was begun during the night time. The main ditch, 100 feet from the highway right of way, broke at 5 a.m., and the water soon covered the highway for a distance of some 400 feet, and to a depth of three feet. The ditch tender of the irrigation district happened to be near at hand and the two defendants were notified to stop the breaks and to keep the water off the highway. No attempt was made to do this, and the water continued to drain onto the highway during the day.

The two ranchers were very indignant when first brought into court, but when the representative of the district testified they had been notified thirty days in advance of the time the water would be turned on, and again twenty-four hours in advance, and that they had been warned when the break first occurred, they decided to plead guilty.

Superintendent Bovey, who had made an investigation, testified the men had made no attempt to repair the ditches prior to receiving the water, and had done nothing to stop the breaks after they occurred.

State Put to Expense.

The state was put to the expense of placing warning lanterns and removing the water as fast as possible. This was done with a 1000-gallon water truck, equipped with a pump. It was necessary to haul the water a quarter of a mile and dump it into an irrigation ditch. The road was practically closed for several hours, and there was much inconvenience to traffic.

Judge Denounces Carelessness.

After being informed of the facts by sworn testimony, Justice Parker denounced the carelessness of the defendants and deplored the fact that negligence upon their part, and upon the part of others, costs the taxpayers considerable sums each year. The incident was given publicity in the Stockton press, and has established a precedent which will help enforce the law in that county in the future.

Discussing the case and the importance of keeping water off the highways, particularly in the summer time, Superintendent Bovey made the following statement to the *Stockton Record*:

> "People have no idea of the amount of damage that can be done to a highway by water, especially in the summer time. When water escapes from ditches and enters the borrow pits along the roadside, if allowed to stand, most of it eventually finds its way into the highway subgrade. It is drawn up by capillary attraction, and, under heavy impact of vehicles pounding along the pavement, a pump-like action is started. The pavement gradually is undermined through the softening of the subgrade and the road goes to pieces.
>
> Before running water into irrigation ditches bordering along highways, the farmer should see to it that his ditches are in good shape. Weeds should be removed and squirrel holes should be sealed by harrowing the sides and bottoms of the canals. There is no disposition on the part of the California Highway Commission to prosecute persons who exercise ordinary diligence. We are only after those individuals who seem to show no appreciation of their obligation to their neighbors and to the general public.
>
> When irrigation water gets into the borrow pits, along the highways, those responsibile for the situation can be compelled to remove it by pumping it off. If they fail to do so, we can remove the water and charge the expense to the property owner."

ON THE VENTURA COAST—Spreading a rock "blanket" over a sand fill, a step in the construction of the Coast boulevard, south of Oxnard. (Division VII.)

EXPERIMENTS ON SOLANO LATERAL DEMONSTRATE INEFFECTIVENESS OF SUBGRADE IMPROVEMENT BY SOIL ADULTERATIONS

(From a report of Research Engineer C. L. McKesson.)

ADULTERATION of subgrades with cement or lime compounds as a means of improving subbase conditions by securing stability in heavy soils is ineffective and uneconomical.

This, in brief, is the report of Research Engineer C. L. McKesson, to the State Highway Engineer, after a study of experimental sections on the Rio Vista lateral, Solano County, placed in 1921 and 1922 by the California Highway Commission.

The special subgrade treatment was undertaken in an effort to determine, if possible, an economical method of treating adobe to eliminate its swelling and plastic condition when saturated with moisture, and subsequent shrinkage and cracking when dried out. The plan tried called for the thorough mixing with the subgrade in varying quantities and depths of Portland cement, hydrated lime, limestone dust, and asphaltic oil.

Twelve Sections Tried Out.

The work was started in 1921, and the pavement was completed during the summer of 1922. Twelve sections, with one exception, each 500 feet long, were chosen; an effort being made to select those with soil conditions as nearly identical as possible. An examination shows the soil to be adobe and silty clay, with some variations in quality.

The treatment consisted of loosening and pulverizing the subgrade to a depth of six and twelve inches, after which the various adulterants were mixed with the soil and well worked into the subbase. Except on the experimental sections, a four-inch gravel subbase was placed on all heavy soil on the paving project. It is possible, therefore, to compare this more or less standard method of subgrade treatment with the various experimental admixtures. An eighteen-foot concrete slab, five inches in thickness, was placed.

Observations After Two Years.

After the work had been down for more than two years, Mr. McKesson made a condition survey. He reports the relative efficiency of the various methods of treatment, based on the present condition of the pavement, as follows:

FOUR INCH GRAVEL SUBBASE on untreated subsoil is found to be very efficient. All sections in good condition. No longitudinal cracks and transverse cracks are 40 to 100 feet apart.

SIX INCH PORTLAND CEMENT (Sec. a, b, 3 and 4).

Where subsoil is similar, there is little or no difference apparent between sections having 1-10 and 1-20 admixtures. Failures consist of transverse cracks averaging about 40 feet apart.

TWELVE INCH ASPHALTIC OIL (5 gal. per sq. yd., Sec. 8).

This section has transverse cracks averaging about 25 feet apart. There is little difference in condition between this section and the twelve inch Portland cement sections.

TWELVE INCH HYDRATED LIME (Sec. 5).

This section has transverse cracks 10 to 60 feet apart, and several short irregular longitudinal cracks. Some surface checking was also noted.

TWELVE INCH PORTLAND CEMENT SECTIONS.

Sections 1 and c, with 1-10 admixture, are in slightly better condition than sections 2 and d, having 1-20 admixture. Transverse cracks on average about 30 feet apart on sections 1 and c and about 25 feet on sections 2 and d. Sections 1 and 2 have a number of longitudinal cracks. The average condition of these sections is slightly better than the plain untreated Section 7, but not enough to justify any expenditure.

PLAIN TWELVE INCH.

This section was plowed up and soil pulverized as for admixture treatments. It was then rerolled, without the addition of any adulterant. Pavement on this section is in little worse condition than on twelve inch 1-20 cement section, but the soil is apparently heavier than on any other section of the experimental work. A comparison of this section with gravel subbase sections, shows clearly the benefit to be obtained from the use of a gravel subbase.

TWELVE INCH LIMESTONE DUST (Sec. 6).

This section is in the worst condition of all. The pavement is broken up into narrow strips by the many transverse cracks, and in some places short longitudinal cracks are numerous. Had it not been for transverse reinforcement, this section would probably be a total failure.

Commenting upon the Rio Vista lateral experiments, Mr. McKesson states they appear to justify three conclusions, which he sums up as follows:

1. That soil adulteration with cement or lime compounds is not an efficient or economical method of securing stability in heavy soils.
2. That the suitability of soil for subgrade purposes, or of the merits of various methods of soil treatments, can be determined by relatively simple laboratory tests and that expensive field tests, in some cases at least, can be avoided by first resorting to a properly conducted laboratory investigation.
3. That a sand or gravel layer is an efficient and economical method of minimizing damage to pavement, resulting from swelling or shrinkage of the subsoil.

Bureau Gets Similar Results.

In making his report, the Research Engineer calls attention to the fact that the results of the California tests are similar to those obtained by A. C. Rose, who conducted like experiments for the United States Bureau of Public Roads at about the same time. The federal experiments were made with Cove clay, a soil similar to the adobe of the Rio Vista lateral, in this state.

In the report of his tests, Mr. Rose makes the following statement, which will be of interest to California engineers:

"Adulterating the subgrade with a lime compound or sand to a depth of one foot reduces shrinkage in the portion adulterated, but the subsoil for a considerable depth beneath this treated layer would continue to swell and shrink and displacement of the upper layer and of the pavement would doubtless continue, although to a less degree. The efficiency of this method of subgrade treatment is doubted.

The Better Treatment.

"It is believed that a better treatment of heavy soil subgrade is:

1. To use a sand cushion to act as an equilibrant to run into irregularities of the subgrade, which is deformed by shrinkage or swell of the soil, and thus to maintain a uniform surface in contact with the base of the pavement, or
2. To establish an unchanging moisture content in the immediate subgrade."

ROAD HOGS AND HIGHWAYS—THE COMMISSION GOES INTO THE PORK BUSINESS

THIS is the story of Ralph Brown's pigs. It is also a story of practical economy in the administration of public affairs. Brown, it should be explained, is a blue eyed young man who builds roads for California with labor supplied by the Folsom State Prison. Brown's achievements as a road builder are well known to those who are in touch with California's prison road camps, but few are aware of his success as a hog raiser.

Brown's hogs are the kind that help build roads, rather than appropriate them. His hogs go into food for prison labor.

It began up in Yuba County in 1918, when Brown was in charge of the Folsom Prison camp, engaged in building the Downieville lateral from Nevada City into Sierra County. The camp was located near Comptonville when Brown first started raising hogs.

How it Started.

It had been his practice to distribute the camp garbage to local residents gratis as the best means of securing its prompt removal. It appears, however, the local ranchers had some difficulty in agreeing among themselves upon a division of the camp spoils, and, to end their disputing, Superintendent Brown decided to utilize it himself by raising his own hogs. That's how the Commission got into the hog business.

The division engineer, Mr. T. A. Bedford, approved the plan and a purchase order was issued for five purebred Berkshire sows and a Poland-China boar, which were purchased at a cost of $20 per head.

During the first two years Brown slaughtered $2,400 worth of pork. Then the camp was moved to Trinity County, which caused a temporary slowing down of pork production. Over a period of several years, however, an average of $2,000 worth of pork was slaughtered annually. Last year the camp was moved to the Kern River Canyon, east of Bakersfield, and in the new location, $1,500 worth of hogs have been butchered. The recent hog population of the Kern camp was 165 head, consisting of 20 mature sows, a boar, and the balance suckling pigs and feeders.

Brown values his present herd at easily $1,500, and estimates the value of pork butchered during the last six years at $8,000. The initial investment was $120, and he still has two of the original Berkshire sows.

When the camp was moved from Downieville to Trinity County, a three-deck truck was constructed, in which sixty-odd hogs were moved 250 miles to the new camp, in about two days, the truck traveling night and day. But one head was lost during the trip, which was made in the month of August.

Waste is Eliminated.

Camp scraps, that otherwise would go to waste, are used for feeding. Of course, Brown has little labor trouble as there are plenty of men who would rather be swine herders out in California's glorious mountains than rock breakers within the walls of Folsom Prison.

It always has been the policy of the Commission to provide prisoners working on the highways with plenty of good wholesome food. And in the Folsom camp, Brown's hog industry furnishes a considerable part of the meat supply. It is a notable example of the economies practiced in the management of the state's prison road camps.

KERN COUNTY GRADING ROADS IN ANTICIPATION OF STATE MAINTENANCE

IN ANTICIPATION of state maintenance, after January 1, 1926, of all traversable roads within the state highway system, as authorized in Assembly Bill 589, Kern County is expending approximately $30,000 for the improvement of sections of the Kern River-Walker Pass state highway. The first unit under construction by the county is a heretofore uncompleted three-mile extension of Niles street, directly east of Bakersfield. It is located, in part, on the present county road, the eastern end following the new state highway location. The road is being graded, and proper drainage structures installed.

Rebuilding Lateral.

At Democrat Springs, the eastern terminus of the state construction authorized (now rapidly nearing completion by convict labor), the new state highway ends in a narrow county road. The county, for the past two months, has had a force of men and equipment at work rebuilding the road from Democrat Springs to Bodfish, a distance of seventeen miles. The new roadway is being made twenty feet wide, with frequent elimination of sharp curves, and improvement of alignment and grades.

In the eastern part of the county, the state highway between Mojave and the easterly boundary is being graded on the state survey.

In so far as gaps in the state highway system are concerned, Kern County soon will have her roads ready for state maintenance.

VISITS CALIFORNIA TO LEARN ROAD BUILDING

DETERMINED to learn road building by actually participating in it, A. A. Nattrass, contractor of Taihapi, New Zealand, has been spending some time in California working on state highway projects as a common laborer.

Nattrass has been traveling about the state observing methods in use on state highway construction. Whenever a particular job interested him, he secured employment, and studied California practices by actually participating in the building of the highway, placing the pavement, or whatever else may have been under way.

Upon visiting the Sacramento headquarters, he declared California the best place in the world to study modern highway construction. Nattrass is the second New Zealander to make a study of California state highways in recent months.

INVESTMENT IN MOTOR VEHICLES

THE automobile has been perhaps the greatest single new productive force in the economic and social development of the United States in the past twenty-five years. Practically unknown when the twentieth century began, individual transportation has since added billions of dollars of wealth to the nation's resources.

In 1900 there were but a few hundred automobiles in the United States and their use was regarded as a luxury limited to the few. Today there are 17,500,000 motor cars and trucks, one to about every seven persons, performing for the most part an essential transportation function.

Naturally enormous sums have been invested in the purchase and maintenance of these machines. For ten years the average sum spent in the acquisition of cars has been close to $2,000,000,000 annually and the amount expended for gasoline, tires, repairs and garage items will now average almost three times that amount.—*Committee on Highway Transport.*

FRACTURED CONCRETE TEST SPECIMENS HEAL AND SHOW INCREASED COMPRESSIVE STRENGTH WHEN RETESTED

By F. T. Maddocks, Testing Engineer.

A RECENT press report quotes Professor Duff Abrams of Lewis Institute, Chicago, as announcing that concrete cylinders, once cracked and then retested after a period of years, had been found to have developed a strength equal to two and one-fourth times the strength originally developed.

This phenomenon was noted in 1918, in the California testing laboratory.

A specimen, received from Sacramento County, which had been previously broken, was placed in the compression machine and developed considerably more strength than when first tested. This led to a short series of tests in which specimens were broken at ten days, returned to the storage water, and again broken at twenty-eight days. In nearly every case, an increase in strength was noted.

Additional tests were made during 1924 with specimens received from the field. Two of these specimens are molded each day by the resident engineers, one for ten-day strength and the other for the twenty-eight-day test. Ten-day cylinders were removed from the testing machine the instant they received their ultimate loads, and replaced in the storage tanks. They were again broken at twenty-eight days along with the regular twenty-eight-day specimens.

At the present time, seventy-four specimens have been broken. The results are shown in the attached table.

What the Tests Showed.

When rebroken at twenty-eight days, 88 per cent of the cylinders showed an increase in strength ranging from 0.2 to 74.5 per cent. The average of all specimens was 21 per cent. The average increase of the unbroken twenty-eight-day over the ten-day specimens was 38.5 per cent. Twenty-six per cent of the unbroken samples were stronger at twenty-eight days than the regular twenty-eight-day cylinders for this period. This may be due to a lack of uniformity in fabricating the two test pieces, representing the day's run.

It is not probable the ultimate strength of concrete, once broken, ever will equal the strength of the same concrete had it been cured to final test without being fractured. It is evident, however, there is a pronounced tendency for the concrete to reunite across the fractured area.

Chemist Explains Phenomena.

The phenomenon is explained by G. H. P. Lichthardt, chemical testing engineer for the California Highway Commission, as follows:

"The increase of strength in concrete, subjected to a stress that will injure it, is due to the added results of the completed chemical reactions which have taken place subsequent to the injury.

One of the compounds formed by the hydration of cement is a kind of calcium hydrate, which is water soluble to the extent of about 15/100 per cent; therefore, should concrete be placed in water, this hydrate would dissolve until a saturated solution is obtained. If the test piece be taken from the curing vat, cracked or caused to yield without disintegration, and then replaced in the water, or kept moist, crystals will be deposited upon the facets of the freshly exposed material. This secondary deposit has the effect of sealing the cracks, but naturally will not have the strength of the original material.

The same action will take place in concrete which is alternately wet and dried, as well as that which is immersed in the curing vat, but the healing will be of longer duration and the deposit weaker as there is greater opportunity for carbonation taking place."

Value of Discovery.

This discovery, noted in California seven years ago, is probably of more academic than practical value. It is well to know, however, minor cracks that may appear during the initial setting of concrete structures, particularly bridges, and in pavements, do not mean a failure is eminent. A sealing process probably is going on, and the ultimate strength of the concrete, in many cases, may not be seriously impaired.

TABLE SHOWING STRENGTHS OF 6 x 12 CYLINDERS BROKEN AT TEN DAYS AND REBROKEN AT TWENTY-EIGHT DAYS COMPARED WITH SPECIMENS SAME CONCRETE BROKEN AT TWENTY-EIGHT DAYS.

Test number	Strength in pounds per square inch			Per cent increase in strength	
	10th day	*28th day (10 day broken specimen)	**28th day unbroken	At 28th day (10 day broken specimen)	At 28th day unbroken
01028	2,880	2,590	3,090	—10.0	7.2
01033	3,085	2,450	4,590	—20.6	48.8
01034	4,615	4,330	5,520	—6.2	20.0
01037	2,715	3,230	3,590	19.0	32.2
01042	2,420	3,780	3,275	56.1	35.4
01044	3,795	5,390	6,060	42.0	59.7
01046	4,850	5 425	6,700	12.0	38.1
01049	2,315	3,250	3,790	40.4	63.7
01047	2,005	2,825	3,515	40.9	75.4
01050	3,455	3,385	4,355	—4.8	26.0
01052	2,605	2,800	3,415	7.5	31.1
01054	3,490	2,545	5,150	—27.0	47.5
01055	3,585	2,330	4,590	—35.0	28.0
01079	2,670	3,105	3,170	16.3	18.7
01080	2,635	3,550	3,955	34.8	50.1
01081	2,560	3,040	2,750	18.8	7.4
01082	2,680	2,970	3,270	10.8	22.0
01083	2,985	2,990	3,675	0.2	23.0
01084	3,105	3,625	3,775	16.8	21.5
01093	2,320	3,330	3,175	43.5	36.9
01094	2,600	3,910	3,480	50.4	33.9
01100	2,755	3,205	4,465	16.2	62.0
1016	2,520	2,395	4,040	—7.6	55.7
1019	2,860	3,000	4,970	4.9	73.8
1034	3,250	3,190	3,160	—1.8	—2.7
Average 25 specimens	2,990	3,310	4,060	12.7	36.6
Average 74 specimens	2,620	3,170	3,630	21.0	38.5

*These specimens were broken at ten days, then cured in water for an additional period of eighteen days, then rebroken on the twenty-eighth day.
**Corresponding specimens from same concrete cured in water twenty-eight days and then broken.

A view on the Ventura boulevard between Los Angeles and Ventura, showing new "second story" concrete pavement twenty feet wide placed over the old fifteen-foot slab. A gasoline tax job.

WHAT THE DIVISIONS ARE DOING

DIVISION III.

HEADQUARTERS, SACRAMENTO.

F. W. HASELWOOD, ACTING DIVISION ENGINEER.

Counties of Butte, Colusa, El Dorado, Glenn, Nevada, Placer, southern Plumas, Sierra, Sutter, Yuba, and northern Sacramento and Yolo.

THE Nevada Contracting Company has equipment on the job and is starting work on the grading of the last section of the Truckee River highway from Floriston to the Nevada line. The race is now on to get the road open in time for 1926 travel.

Other grading contractors in the division are making good use of the summer. C. R. Adams, contractor, between Colfax and Gold Run, is working his power shovels three shifts daily.

The time for the completion of the Williams grading and surfacing contract, on the Tahoe-Ukiah highway, Colusa County, has been extended to August 26th.

The approaches to the dangerous grade crossings at Emigrant Gap are being improved, until such time as funds are available for their elimination.

Manetas and Company have been given an informal contract for placing 600 cubic yards of masonry walls on the road about Lake Tahoe.

W. H. Miller is superintendent in charge of the state forces engaged in placing an asphalt seal coat on the Auburn-Colfax section.

DIVISION VI.

HEADQUARTERS, FRESNO.

J. B. WOODSON, DIVISION ENGINEER.

Counties of Fresno, Madera, Merced, Mariposa, Kings, Tulare, and Kern, north of the Tehachapi.

THE contracts of H. H. Peterson, and Stewart and Bland, who have been doing widening and "second story" paving work north of Fresno, have been extended to include placing of rock shoulders alongside the new pavement. The new twenty-foot pavement may then be considered completed in first class shape.

The Kaiser Paving Company is at work placing ten miles of rock shoulders in the vicinity of Los Banos on the Pacheco Pass lateral. The contract was awarded recently by the commission.

DIVISION VII.

HEADQUARTERS, LOS ANGELES.

S. V. CORTELYOU, DIVISION ENGINEER.

Counties of Los Angeles, Ventura, Orange, San Diego, and eastern Kern, south of Mojave.

AFTER having been under way for more than two years, the famous Hauser contract, for grading a section of the Coast Boulevard in Ventura County, has been completed and the contractor has moved off the job. This project was one of the most difficult ever undertaken in the history of highway construction in California.

Grading has been completed and pavement is being placed on the widening of the Whittier boulevard between Montebello and Whittier, where a fifty-six-foot street is being placed to handle southern California traffic. The county is paying half the cost.

Widening and thickening of the highway north of Oceanside has been begun. Between San Juan Creek and Galivan, embankment widening has been completed and placing of pavement started. Jahn and Bressi have both contracts.

DIVISION X.

HEADQUARTERS, SACRAMENTO.

J. C. McLEOD, DIVISION ENGINEER.

Counties of Amador, Calaveras, Alpine, Tuolumne, Stanislaus, San Joaquin, Solano, and southern Sacramento and Yolo counties.

APPROACHES to the Rio Vista bridge over the Sacramento River are being paved by the Valley Paving Company under an informal contract.

J. F. Knapp has completed the second-story pavement and "flush" shoulders from Manteca south to the Stanislaus River, and is now working north from Manteca to Turner Station, where grading is under way.

The "flush" shoulder work between Woodland and Davis, being done by the Kaiser Paving Company, is about completed.

Maintenance allotments have been made for line and grade changes on the Red Lake grade, east of Carson Pass on the Alpine highway, and near the Kinner Reservoir east of Ebbett's Pass, both in Alpine County.

Funds also have been allotted for additional surfacing work between Ione and Jackson, in Amador County.

A special authorization has been approved for grade widening and improvement on the Big Oak Flat road between Bucks Meadow and South Fork. This is a popular entrance to the Yosemite.

BRIDGE DEPARTMENT NEWS

HARLAN D. MILLER, Bridge Engineer.

THE need for a new under pass under the tracks of the Sacramento Northern railroad, at West Sacramento, was demonstrated recently, when the present narrow wooden subway caught fire and held up traffic for several hours. Bids have been asked for the new subway, which will have a clear roadway width of thirty feet, in addition to sidewalks. The blind curve also will be eliminated.

Bids also have been asked for a concrete girder bridge across Willow Brook, Sonoma County, on the Redwood highway. It will have a width of thirty feet and will replace a county-built structure which collapsed last winter during high water.

Bordwell and Zimmerman, contractors, have begun work on the Charley Creek arch, on the Pacific highway in the Sacramento River Canyon. W. H. Johnson will be the resident engineer.

T. K. May and O. P. Dodds have been added to the staff of the bridge department.

Harold Peacock has been attending the Red Men's convention at Pismo Beach, as a delegate from Sacramento.

E. A. Welch and Norman B. Raab are others from the department recently on vacations.

EQUIPMENT DEPARTMENT NOTES

R. H. STALNAKER, Equipment Engineer.

THE Equipment Department has taken charge of the new shop recently completed at Crescent City, on the Redwood highway. The shop located at the Smith River convict camp has been moved to the new building and is in charge of Mechanic Frank E. Symns.

J. W. Grace is in charge of equipment in Division I. He reports the Willits shop greatly encouraged by its success in the construction of certain auxiliary equipment. Recent work turned out includes a hand operated crane, mounted on a standard cargo truck for moving heavy equipment.

Protracted rainy weather of the coast section makes necessary protection for operators of Fordson tractors. The top designed

by the shop keeps the equipment on the road, when maintenance work otherwise would have to be discontinued.

A six-ton trailer has been built from an old Packard truck chassis.

A new cleat to protect bolt heads on Yuba tractors also has been devised, which has prolonged the life of bolt heads on this equipment from a week to several months.

Remodeling work at the headquarters shop, Sacramento, is well under way.

WORK OF THE EQUIPMENT DEPARTMENT—Above, Hand operated crane mounted on standard cargo truck, built at the Willits shop. *Inset*, Fordson tractor equipped with special top to shield operator and machine, particularly during stormy weather. *Below*, gasoline shovel removing slides. It is equipped with a steel cab to protect operators and machinery from falling rocks and earth, and is electrically illuminated for night work. Equipment in service on the Redwood highway.

ALL-WESTERN ROAD SHOW.

Western highway builders are expected to take considerable interest in the All-Western Road Show, which will be held in San Francisco during the week of November 9th. This date has been definitely decided upon and the management promises a comprehensive display of the latest road building machinery. A number of organizations are planning meetings in San Francisco during the week of the exhibit. The show is the first of its kind to be held in this section of the country.

Not more than "45 minutes from Broadway" a concrete crew was laying a road through a New York village recently, and in front of the home of an observant old lady the reinforcing steel mesh was being put in place. The placing of the wire mesh greatly impressed her.

Later in the day the old lady, discussing the new pavement with one of the village trustees, said:

"Now I know why concrete pavements are so easy to ride on. This morning I watched them lay the bed springs in the concrete."—*Highway Engineer and Contractor.*

YES, THEY DO COST MORE

The State Highway Commission received bids yesterday for grading that portion of the Old Trails highway between Victorville and Hicks. The bids ran from $155,000 to $173,000. And inasmuch as this contract does not carry any paving at all, some idea of the large expense of road building, these days, may be had.—*Redlands Facts.*

THE California Highway Commission is well aware of the increased cost of highway construction. The 1913 dollar is worth about 55 or 60 cents today. Pavements, originally considered adequate when they were fifteen feet wide and four inches thick, now have a minimum width of twenty feet and a minimum thickness of six inches with nine inches at the edges. In many places, pavements must be much wider and even thicker to care for 1925 traffic. Twenty-one-foot grades of 1912 must now have a minimum width of thirty feet; there must be no more sharp and blind curves.

California had 75,000 motor vehicles in 1912, when state highway construction began; the prediction for 1925 is 1,500,000. Highway construction is done by contract, awarded after open competitive bidding, and just now there is plenty of competition, too.

But highways can't be had for what they cost in 1912 no more than newspaper print, shoes, clothing or anything else necessary to supply the needs of our modern civilization.

OLD PIPE MAKES FENCE POSTS

BEFORE commencing construction of a foreman's cottage and the combination bunk house and garage at the New Santa Clara River maintenance station, Ventura County, Division VII, the site was fenced that building materials might be safely stored on the premises, while work was in progress.

The fence, a little over seven feet high, was constructed with seventy-six inches of woven fence wire with three strands of barbed wire on top. Fence posts were made at the Lankershim shop from old discarded two and two and a half inch pipe.

It required 1260 lineal feet of fence to enclose the station site. The cost was 37 cents per foot of fence for materials, and 32 per cent per foot of fence for labor. Cost of gates is included in the above.

Several other maintenance stations in Division VII have been enclosed with the same type of fence, which has proved satisfactory.

DISCARDED PIPE NOW FENCE POSTS—Division VII uses discarded pipe for fence posts when enclosing maintenance yards. The pipe is secured from the Lankershim shop. The view above shows the fence being erected at the new Santa Clara River station. This type of post has proved satisfactory.

STATE HIGHWAY FUND CONTRACTS (Bond Funds, Including Federal Aid)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE JULY 13, 1925.						
458	VIII	San Bernardino–Riverside	26	B-A	One third mile north San Bernardino County Line to Beaumont	7.10	P.C. Concrete Base	Bassich Bros. Co.	$212,594 96	Nov. 15, 1924	------
					AWARDED SINCE JULY 13, 1925.						
476	VIII	San Bernardino	31	D-E-F	Victorville to Hicks	25.74	Grade and Gravel	H. G. Fenton	$182,037 49	July 29, 1925	250
477	VIII	Riverside	26	E	Across Coachella Stormwater Drain	------	R.C. Girder Bridge	Badt, Falk and Bergendahl	42,181 88	July 29, 1925	125
478	VIII	Imperial	27	D	Holtville to East Highline Canal	6.90	Grade and Gravel	Norman B. Conway	122,264 48	Aug. 14, 1925	225
479	VII	Orange	60	A-B	Newport Beach to Laguna Beach	9.78	4.00 miles R.C. Concrete Pavement 5.78 miles Asphalt Macadam	Kavanagh and Twohy	219,560 06	Aug. 14, 1925	250
					Sub-total	42.42			$566,043 91		
					PENDING AWARD.						
------	VII	Los Angeles	60	A	Latigo Creek to Las Flores Canyon	6.68	P.C. Concrete Pavement		205,672 50	------	------
					Total State Highway Fund Jobs Awarded and Pending Award	49.10			$771,716 41		

NOTE—Primary construction covered by the above contracts does not include funds obligated on cooperative forest highway projects, prison road camp activities, or day labor jobs not being done under contract.

STATE HIGHWAY MAINTENANCE FUND CONTRACTS (Including Gasoline Tax Fund)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE JULY 13, 1925.						
M-61	VIII	San Bernardino	------	------	San Bernardino	------	Shop Building	Houghton and Anderson	$27,937 13	Feb. 13, 1925	------
					AWARDED SINCE JULY 13, 1925.						
M-94	VI	Fresno	------	------	Fresno	------	Maintenance Shops	J. P. Williams	$32,953 50	July 29, 1925	90
M-95	II	Shasta	3	C	Charley Creek	------	R.C. Bridge	Bordwell and Zimmerman	80,741 76	July 29, 1925	175
M-96	VIII	Riverside	26	E	Edom to 2 miles north of Indio	9.10	P.C. Concrete Shoulders	Bassich Bros. Co.	90,249 75	July 29, 1925	150
M-97	VII	Los Angeles	2	D	Philadelphia Street to Michigan Ave.	1.90	P.C. Concrete Pavement	J. Paul Benson	93,185 66	Aug. 14, 1925	125
					Sub-total	11.00			$297,130 67		
					PENDING AWARD.						
					Total State Highway Maintenance Fund Jobs Awarded and Pending Award	11.00			$297,130 67		

NOTE—The above obligations charged against the State Highway Maintenance Funds do not include funds from these sources obligated for general maintenance and for specific betterments not being done under contract.

HIGHWAY NEWS NOTES

STATE Highway Engineer R. M. Morton made a trip to Washington, D. C., during the early part of the month, to attend a meeting of the joint board appointed by the Secretary of Agriculture to prepare plans for a uniform system of warning and direction signs for the federal aid highways. Mr. Morton is a member of the board.

J. C. McLeod, Division Engineer, Division X, was unable to attend the recent staff conference in Los Angeles because of illness. He is now back on the job.

Secretary F. W. Mixon is taking the first vacation he has had since his appointment in January, 1923.

Mrs. Julia Harlow, of the BULLETIN office, has returned from a vacation trip to Portland and Seattle.

Mrs. Alice Nathan is another vacationist who is back in the office.

Miss Gladys Miller, stenographer-clerk in the Willits shop, motored to Yosemite National Park recently in her new car.

Arthur E. Shaffer, of Shop I, returned to Willits recently with a brand new bride.

Miss Elizabeth Etzel, of headquarters, drove all the way to Canada and back while on her vacation.

H. O. Ragan and Norman Coote, respectively resident engineer and assistant on the concrete shoulder job north of Fresno, Division VI, have completed this work and moved to Bakersfield to take charge of 8.2 miles of asphalt reconstruction work now under way.

W. F. Walker has been promoted to the position of foreman on the widening work under way along the west shore of Lake Tahoe.

A. D. Griffin, after having spent several years on the Ventura coast as resident engineer on the Hauser contract, Division VII, has been assigned to a "second story" concrete job in San Diego County. Ralph D. Kinsey is assistant on the same contract.

E. B. Milnor and O. W. Monroe have been assigned to the Jahn and Bressi contract as assistant resident engineers.

W. J. Nelson is now on the San Onofre line change as assistant resident engineer.

THE LAITY'S VIEWPOINT

A REMARKABLE lay encomium for the cause of road construction recently came to my attention. In the *Typosium*, a publication for Los Angeles printers, appears the following editorial comment:

> "Did you ever stop to think how much a good road has contributed to civilization?
>
> "Once upon a time all roads led to Rome. And why? Only because Rome saw to it that all roads were well paved. They made going easy. And when it was necessary to make a short cut to any place, she made it. Travelers tell us that the Appian Way is still a marvel of a good road.
>
> "It was only the barbarian that made it difficult for travelers and commerce to pass freely from place to place. Shakespeare shows us in the 'Comedy of Errors' that it was death for a Syracusan to be found in Ephesus and vice versa.
>
> "One reason why Henry Ford is the truly great man that he is, lies in the fact that he has made a car for the multitude. Under the car must be a good road. There were Henry Fords in Rome, and there were great road builders, but there were also small-visioned men who said, 'If you make a better chariot than the ox-cart, you will hurt business in our town.' So these chaps put up barriers to travelers and commerce. They stood at the bridges and collected tolls. Then civilization limped, and it still limps because of the same things.
>
> "Good roads have aided civilization because they make it easier for men to meet on common ground—to pass from this place to that—and enable commerce to exchange its surplus here for that surplus there. Every hindrance to this achievement is a harking back to barbarism."

There can be no doubt but that the citizenry appreciates the merits of improved highways but the impression that road construction is a transient activity must be corrected and the fact that highway building, reconstruction and maintenance will be without end, must be sedulously proclaimed.—*Western Highways Builder.*

A Proper Retort.

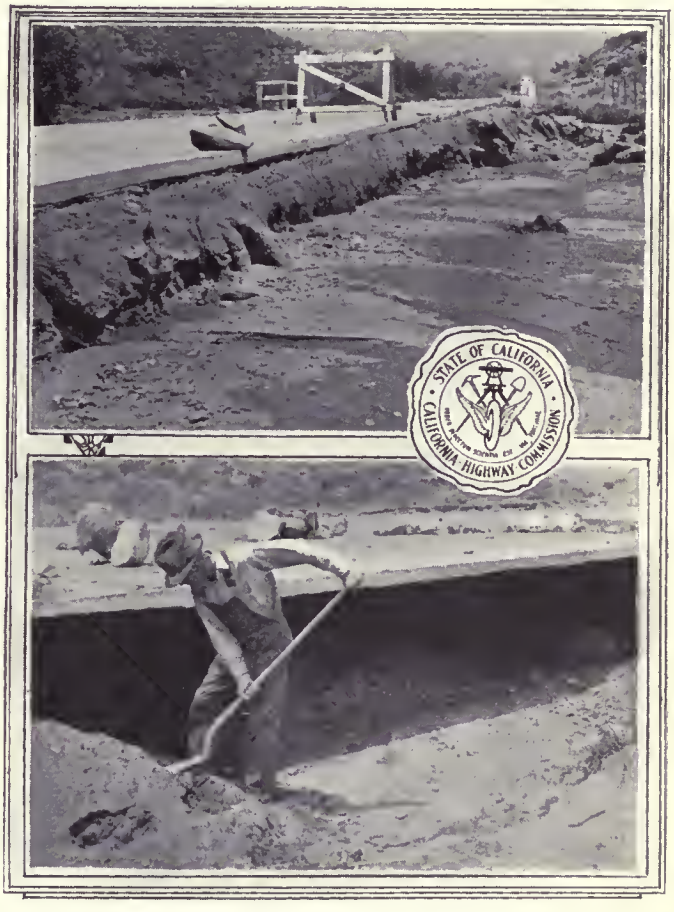
"It's no wonder you're such a sissy," declared the bad boy. "You're pa and ma were married by a justice of the peace."

"Well," retorted independent Mary, "from the noise I hear coming from your house, your pa and ma must have been married by the secretary of war."

CLOUDBURST LANDS ON HIGHWAY

IN MINT CANYON, about twenty miles easterly from Saugus, Division VII, two opposing groups of clouds got together recently and had a little cloudburst. The excitement lasted about an hour and it all happened along a three-mile stretch of highway. Water running two feet deep down the roadway washed a truck loaded with hay off the pavement.

Several culverts were filled with debris, shoulders were badly washed and the pavement was undermined in several places, as shown in the illustrations.



WHERE MAINTENANCE MONEY GOES—The views show what a cloudburst did to a section of state highway in the southern part of the state. The concrete slab held despite the washing away of the subgrade. Gasoline tax funds help to finance repair work of this kind.

HIGHWAYS BENEFIT FARMERS

The development of motor transportation has revolutionized the life of the farm. It has brought the town and country into closer touch. It has in a considerable degree destroyed the historic isolation of the farm and the farmer. It has permitted a notable extension in educational facilities available for rural populations. The centrally located school reachable by motor transport from a large surrounding area has largely contributed to the solution of the problem of adequate equipment and adequate instruction for the rural children.—*Committee on Highway Transport.*

In a Broadway Street Car.

First Kindergarten Teacher—"And how many children have you?"

Second Kindergarten Teacher—"Twenty-nine. And how many have you?"

First Kindergarten Teacher—"Thirty-six."

Pat, in seat ahead—"Say, what part of Ireland are ye from?"

—*Carnegie Tech. Puppet.*

The above map shows the federal aid highway system of California in its relation to other state highways. The roads shown on this map constitute the present state highway system, except in one or two minor particulars where the federal aid system includes short sections not designated state highways.

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JOHN E. KING, State Printer
SACRAMENTO, 1925

CALIFORNIA HIGHWAYS

A BULLETIN ISSUED BY THE CALIFORNIA HIGHWAY COMMISSION FOR THE INFORMATION OF ITS EMPLOYEES AND THE PUBLIC

Vol. 2 SEPTEMBER, 1925 No. 9

REDWOOD HIGHWAY—View on a recently completed section of the Redwood highway between Trinidad and Orick, Humboldt County. The road is rock surfaced, wide and straight, in accordance with present high standards of construction.

In this issue: SECRETARY'S LETTER ENDORSES FEDERAL AID—SPECTACULAR HAUSER CONTRACT ACCEPTED—MAINTENANCE DEPARTMENT JOINS FIGHT ON PUNCTURE VINE.

CALIFORNIA HIGHWAYS

HARVEY M. TOY, Chairman;
N. T. EDWARDS and LOUIS EVERDING, Commissioners.

ROBERT M. MORTON, State Highway Engineer.

W. F. MIXON, Secretary.

We are pleased to permit publication of any of the matter contained herein or to loan cuts and this privilege is extended newspapers and periodicals without restrictions.

FRANK B. DURKEE - - - Editor
P. O. Box 1103, Sacramento, California.

Vol. 2. SEPTEMBER, 1925. No. 9

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CALIFORNIA HIGHWAY DEPARTMENT

CALIFORNIA HIGHWAY COMMISSION

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F. G. SOMNER, Division IX, Bishop
J. C. McLEOD, Division X, Sacramento

General Headquarters, Fifth Floor, Forum Building, Sacramento

WHY WORRY

about your road taxes when you spent last year these enormous amounts without any complaint.

Estimated Expenditures for Nonessentials, 1924.
(From Statement of U. S. Treasury Department.)

Tobacco	$1,847,000,000
Beverages (nonalcoholic)	820,000,000
Theaters, movies, etc.	934,000,000
Candy	689,000,000
Jewelry	453,000,000
Firearms	67,000,000
Musical instruments	440,000,000
Sporting goods	431,000,000
Perfumes and cosmetics	261,000,000
Chewing gum	87,000,000
Toilet soaps (½ since some are essentials)	76,000,000
Furs (½ since some are essentials)	176,000,000
Radio[1]	150,000,000
American tourists abroad[2]	600,000,000
American tourists at home[3]	1,000,000,000
Total	$8,031,000,000

[1]Radio Corporation.
[2]Department of Commerce.
[3]American Out Door Life Exposition.

Just six months allowance of the above fund would improve the entire Federal Aid Highway System of the United States and thus enable you to drive from the county seat of any county in any state, to the county seat of any county in any other state in the Union, and keep on a paved road.—*American Highways.*

An Ideal.

Therefore when we build, let us think that we build forever. Let it not be for the present delight, nor for present use alone. Let it be such work as our descendants will thank us for; let us think, as we lay stone on stone that a time is to come when those stones will be held sacred because our hands have touched them, and that men will say as they look upon the labor, and wrought substance of them, "See this our Fathers did for us."—*Ruskin.*

SEPTEMBER 1925

California Highways

VOL. 2 NO. 9

SECRETARY'S LETTER ENDORSES FEDERAL AID

THE NECESSITY for the continuation by the federal government of the federal aid for highways policy is fully realized by Secretary of Agriculture W. M. Jardine. This is clearly evident from his letter to Chairman Harvey M. Toy of the California Highway Commission, delivered by officials of the American Automobile Association after their remarkable automobile trip across the continent to participate in California's Diamond Jubilee celebration.

It is sincerely to be hoped that Secretary Jardine's appreciation of the position of the western states, gained from his recent visit, and what is of greater importance, his understanding of the need for a great national system of highways, that Americans may know their country and all sections be bound inseparably together, will prevail among those high in the councils of the nation, when the attempt is made, as it surely will be, to discontinue further appropriations.

The Secretary's Letter.

Californians will be glad to read the secretary's letter, which is as follows:

DEPARTMENT OF AGRICULTURE

WASHINGTON, August 28, 1925.

HON. HARVEY M. TOY, Chairman,
California Highway Commission,
San Francisco, California.

MY DEAR MR. TOY: This letter will be handed you by Mr. Thomas P. Henry, President of the American Automobile Association, and Mr. Ernest N. Smith, General Manager, who are undertaking a motor trip across the continent to participate in the celebration at San Francisco of the seventy-fifth anniversary of California's statehood.

As one of the representatives of the splendid highway building organizations of the coast, you need little reminder of the changes that have come about in transportation within this period, and of the wonderful influence that highway transportation has had upon the economic and social development not only of the west but of the whole of the United States. You and your associates have done splendid work in the building of highways, and I particularly appreciate the endeavors you are making to complete the major highways which are included in the federal aid highway system. Your assistance has extended into other states. The Wendover Cutoff, which I had the great pleasure of formally opening in June, is a remarkable example of cooperation between the states, the federal government and individuals both within and without the state of Utah in which the Great Salt Lake desert is located.

Work Must Go On.

While splendid progress has been made in the past, there is still a very large amount of work to be accomplished. In my trip through the west this summer, I was impressed with the thought that no matter how fine a system of roads the coast states may develop, they will still be dependent for connections with the central and eastern sections of the country, upon highways which lead through long stretches of sparsely settled areas in which the federal government still holds title to a large percentage of the lands which these roads cross. High mountain passes and desert stretches must be crossed with adequate highways before we shall have that tie between the different sections of our country that will lead to a greater unity of purpose and broader understanding which are in themselves worthy objectives of the federal aid highway system.

The trip of Mr. Henry and Mr. Smith is a demonstration of the advance of highway transportation. I understand they expect to be enroute only about a week. The distance is no longer measured in miles but in time. The west and the east are being brought closely together. In expressing these greetings to you on this occasion, it is with the wish that the contacts between the California Highway Department and the other highway organizations of the west coast and this department through its Bureau of Public Roads will be as cordial and profitable in the future as, I found from my western trip this summer, they have been in the past.

Cordially yours,
(Signed) W. M. JARDINE,
Secretary.

FEDERAL HIGHWAY AID IN DANGER

(From *Indiana Highways and Motors.*)

IT WILL surprise all students of the highway problem to learn that federal aid for highway development is in danger. Perhaps it is necessary only to recognize this danger to avoid its consequences. All of the attacks on federal aid, and many of the defenses of it as well, miss the vital points. The money side of the case is comparatively unimportant. Yet it is well to note that federal aid amounts to less than half the money the automotive field pays in federal excise taxes. If any taxpayer is injured, it is the motorist.

But it is in unifying our national highway system by coordinating state systems, in securing highway location according to the principles of engineering and economics, rather than according to the dictates of local political expediency and favoritism, in insuring fair and competent plans and specifications, in insuring the continuation of state highway departments as required by the Federal Aid Act, in securing adequate maintenance of federal aid highways after they are built, and in similar broad fundamentals, that federal aid for highway development finds its ample justification.

Proper provision for national defense requires a national road system which can not be secured without some measure of national aid and supervision.

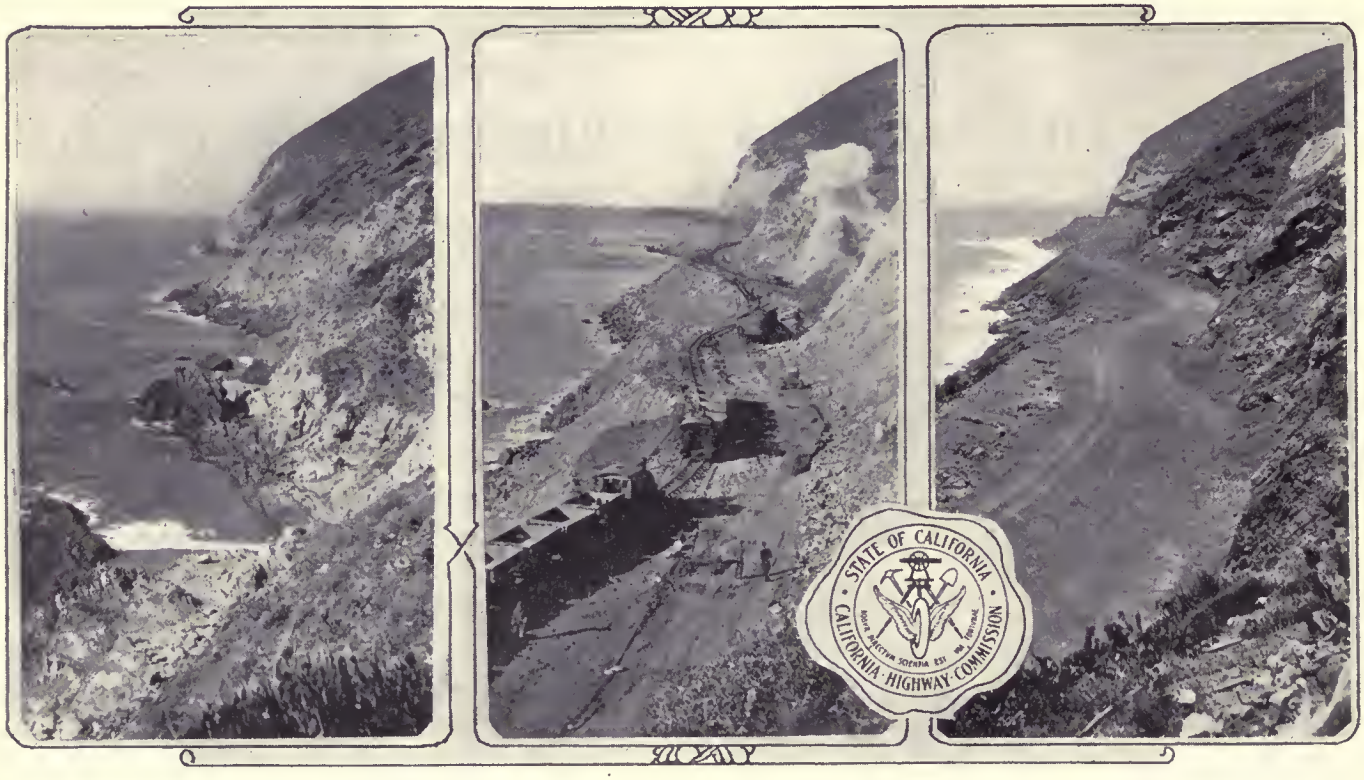
THE GREAT EQUALIZER

Communication is the great equalizer. It destroys animosities, aids understanding, promotes the accord of nations, and contributes to the happiness and prosperity of all who enjoy its unrestricted benefits. In the motor vehicle and improved highway there is promise of substantial betterment of communication and transportation everywhere.—*William M. Jardine, Secretary of Agriculture.*

The cost of bad roads far exceeds the cost of good roads.

Our town is just what we make it. If you don't like the town, you will probably find that the town doesn't like you. But if you have the right attitude, then you will find the community friendly.

SPECTACULAR HAUSER GRADING CONTRACT IS ACCEPTED



HAUSER CONTRACT—Rocky cliffs south of Big Sycamore Canyon, *before, during,* and *after* construction. On this section, 334,000 cubic yards of solid rock were moved in grading a mile of highway. This is indicative of the difficulties overcome on this project. (Photos by Div. VII.)

BY STRANGE coincidence the last dipper full of rock from the big steam shovel was moved from the completed roadway on the famous Hauser contract, on the Ventura coast, just two years to a day from the time the first power shovel of the contractor "rooted in" near Point Mugu, August 13, 1923. The big grading job, probably the most difficult and next to the largest in yardage moved on the California state system, is finished. It will rank among outstanding highway projects of the nation.

By August 17th, the contractor had completed all work and the big railroad steam shovel, that had been eating its way along the rocky coast for two years, was mounted on a special trailer and moved off the job in less than two days, somewhat of a feat in itself. Coincident with the completion of the work by the contractor, final cross-sectioning was finished and the pay quantities fully worked up.

More Than Million Yards Moved.

The final report, including extensions and slides removed, shows 1,213,724 cubic yards of rock and earth excavation in a distance of 7.4 miles, with a total expenditure under the contract or $884,-964.64. The only California highway project comparable with the Ventura job is the Pollock contract for grading along the Monterey coast, south of the Big Sur River, where 1,428,000 cubic yards of material were moved in a distance of thirteen miles.

The quantities moved per mile were heavier on the Ventura job than on the Monterey contract. The most expensive section on the Hauser contract was a distance of one mile through solid rock cliffs, south of Big Sycamore Canyon, where 334,086 cubic yards were moved at a cost of $238,871.20. Deep ocean and heavy surf action at the base of the cliffs demanded that the roadbed, to be enduring, be cut well back into the solid rock.

Earthquake Not Cause of Slides.

The original time limit was extended because of numerous slides and two large rock "slips," totaling 80,000 cubic yards, which had to be removed from the completed grade. Many tons of dynamite were used in blasting, and much difficult and expensive hand sloping had to be done, to remove loose blocks and shaky pinnacles from off the high slopes and ensure the safety of the roadway for traffic.

On newly completed heavy grading jobs slides are always likely to occur. This is particularly true if the geological formations cut through are badly faulted and broken up as is the case along the Ventura coast. The rock slips and slides on the Hauser contract all occurred prior to the recent Santa Barbara earthquake, and, while this quake was felt very strongly along this section of the coast, no damage was evident at the time, nor has anything developed since by which the cause of the slips could be traced to earthquakes.

A Thrilling Chapter.

The finishing of the grading on the Hauser contract, a part of the Oxnard-San Juan Capistrano route, authorized by the bond issue of 1919, completes a thrilling chapter of California highway building. Engineers of the commission risked their lives many times while surveys were being made; men and instruments were let down with ropes over rocky cliffs and some of the work was done while the location men were dangling in midair above the foaming breakers.

When construction started equipment was brought in on ocean scows. Huge steam shovels were beached in the surf and moved in to shore on their own power. Some of the feats performed would seem incredible to the motorist, driving along the completed grade of what undoubtedly will be southern California's most famous ocean shore highway.

The remainder of the work, necessary to open the road southward to Santa Monica, is comparatively easy construction and is all under contract. It is only a matter of months until the grade will be broken through. Opening of the highway to traffic, however, probably will not take place until after paving is completed on a section in Los Angeles County.

GOOD ROADS WEEK—JANUARY 11–16

GOOD Roads Week, during which it is hoped the attention of the American people may be focused upon the necessity for a continuation of highway construction, will be celebrated January 11th to 16th. The same dates have been selected for the annual convention and road show of the American Road Builders' Association, which convenes in Chicago, Monday, January 11th.

HAUSER CONTRACT, NEAR BIG SYCAMORE CANYON—Before, during, and after construction. Heavy blasting was required at this point. Note coyote hole ready for blast in lower right-hand corner of top view. (Div. VII Photo.)

The fellow who is so important that he can drive with only one headlight is all right if those who meet him can guess correctly on which side the light is located.

RESEARCH ENGINEERS TO INSPECT 5000 CULVERTS

HE RESEARCH DEPARTMENT, it is announced by C. S. Pope, construction engineer, has undertaken a comprehensive study of culverts in service throughout the California state highway system, the results of which will be available to the Highway Research Board and to county and city authorities in California.

The objects of the study are: To correlate the various tests and experiments on pipe loads and stresses; to set up a standard of comparison of the life of different kinds and classes of culvert pipe; and to determine the most probable conditions of service for which standards should be designed.

Before the survey has been completed detailed inspection will have been made of at least 5000 culverts of all types. Samples from both the top and bottom of metal pipes will be taken for analysis. Samples of the water passing through culverts also will be secured, when necessary.

To Include All Divisions.

The inspection will be extended to all divisions to insure that the culvert service data secured will represent all possible conditions of climate, soil, and water in this state. A preliminary study of several hundred culverts has indicated that much valuable information will be secured, concerning not only the normal life of culverts of various types but the effect upon their life of location, drainage, soil conditions, and maintenance. In other words, when the investigation is completed the department will know definitely what service culverts are giving on the state highway system.

The investigation will be conducted under the supervision of C. L. McKesson, Research and Testing Engineer. The field work will be done by W. J. Stonebraker, assistant testing engineer, in cooperation with representatives of the division offices.

SUPERVISORS ARE INVITED TO USE RESEARCH DATA

SPEAKING before a gathering of county officials on Supervisors' Day at the State Fair, State Highway Engineer R. M. Morton invited the cities and counties of the state to take advantage of the research and testing work which is being conducted by the California Highway Commission at its Sacramento laboratory.

"This information may be of value to you, it is yours for the asking," said Mr. Morton. He also pointed out that the state law provides that the commission, at the request of local bodies, may make plans and specifications for county or city road work and may act as consulting engineer to assist in planning and supervising local projects.

The highway commission, he assured the supervisors, desires to cooperate with the counties whenever, in their opinion, it may be of service to the people. Numerous cooperative projects on the state highway system were cited as evidence of the cordial relations and mutual confidence existing between the commission and the boards of supervisors, to whom, the state engineer said, the commission looks as the official spokesmen of their several communities on road matters.

AUSTRALIAN ENGINEER ON VISIT.

L. B. Watson, highway engineer of Brisbane, Queensland, Australia, has been spending a month in California inspecting state and county highways, particularly state highways in the San Francisco division, where he was the guest of Division Engineer J. H. Skeggs. Several days were spent at the Sacramento headquarters.

MAINTENANCE DEPARTMENT JOINS FIGHT ON PUNCTURE VINE

PUNCTURE VINE—Here are views of one of the worst pests with which maintenance men have to contend. *Upper left,* the vine as it grows along the highway; *lower right,* a close-up of the thick mat formed by the growing plant; *upper right,* another close-up of the vine; *lower left,* the seed pods, showing the sharp barbs which make it so easy for the plant to be spread. *Center,* pods sticking to an automobile tire. Motor vehicles are one of the greatest spreaders of this pest. (Photos courtesy Fred P. Roullard, County Horticultural Commissioner, Fresno.)

ASIDE from the actual care of the highway itself, no activity of the maintenance department is of greater importance, particularly to the agricultural interests, than its campaign for the eradication of noxious weeds and pests from the highway right of way. The effectiveness of the state's efforts in this direction, it should be pointed out, depend largely upon the cooperation of the owners of adjoining lands, if they be likewise infected, and upon the help secured from counties in cleaning up roads leading into the state highways.

During the latter part of the present month representatives of a number of the San Joaquin Valley counties will meet to plan a valley wide effort for the eradication of the "Puncture Vine," one of the worst pests infecting the highways in certain sections of the state.

Cooperation Assured.

George R. Winslow, maintenance engineer, has assured those interested that the California Highway Commission will do its full share in this campaign. To this end studies have been going on for some time to determine the most effective methods for fighting the weed and a number of experiments, including the use of oil sprays, have been tried.

That the men in the field, who will have direct charge of this work, may have the benefit of expert advice regarding this most persistent aggravation of motorist and farmer alike, the department asked the California Department of Agriculture for information concerning the vine and methods of eradication.

Director Hecke's Statement.

Director G. H. Hecke has kindly prepared the following statement for the information of maintenance men:

> Puncture vine is the common name given to a serious weed pest which botanists call *Tribulus terrestris.* It has earned this common name because of the sharp pointed spines, of which there are two on each bur. This bur is so balanced that one of the two spines always points upward when the bur is lying on the ground. These spines are about as long, and nearly as stout, as an average carpet tack. The burs are borne in clusters of five with the spines outward, giving the cluster a star-shaped appearance. When mature the cluster readily falls apart. An average-sized plant may bear as many as ten thousand burs, within each of which are from two to four seeds, only one of these germinating at a time.

The plant itself is quite attractive, forming a green mat during the summer when most other roadside weeds are dried up. It grows from a central taproot, and from the crown branches are sent out growing prostrate on the ground, often to a length of seven feet in every direction. The leaves are compound, giving a feathery appearance. The silky hairs covering the leaves give them a grayish cast. The flowers are rather small and bright yellow in color.

Traced to Mediterranean.

The earliest record of puncture vine in California gives 1904 as the year, but undoubtedly it existed prior to that time. It is generally presumed it has been brought into this state from Texas in ships' ballast from the Mediterranean region. It is now found in nearly every county traversed by main-line railways, reaching its heaviest infestations in the inland portions of southern California and in the southern half of the San Joaquin Valley.

Spreads Along Highways.

The rapid spread of puncture vine in California, during the past few years, is directly traceable to the improvement of highways and the resulting increase in motor vehicle traffic. The fact that the burs may be readily carried by automobile tires points toward infestations along highways and county roads as the chief sources of spread. The history of the spread of this plant in California is being repeated locally each year with increasing rapidity. It was first introduced along railroads, thence along roads and highways, thence into city streets and lawns, school grounds, parks, camp grounds, waste lands, grazing and other agricultural areas.

The motorist is the first to be affected by the spread of this weed, for his tires can pick up many thousands of these burs and transport them to entirely new locations. However, the present-day tire is believed practically immune to serious damage. The pod portion of the bur, breaking off, leaves the stout spines to work through the fabric after the tread becomes more worn. It rarely happens that an actual puncture occurs, but the life of the tire is appreciably shortened by the weakening of the fabric.

Aside from this feature, the presence of the puncture vine is attended by other distressing features. Injuries are caused to livestock, more particularly cloven-hoofed animals. These pick up the burs between their toes, causing serious infections. Burs occasionally lodge under their tongues, causing ulcers which seriously affect their normal feeding. The value of wool is lessened because of burs. Barefooted children suffer handicaps in walking and grape pickers, who attempt to kneel down in infested vineyards, often come in contact with the sharp spines, not infrequently resulting in infection at the point of contact.

Methods of Control.

Although it is an annual weed, existing through the warmer seasons of the year, early attempts to check the spread of this weed proved difficult. Seeds in the ground sprout at different times of the season. Almost as soon as the plants are large enough to be readily noticed the burs begin to form and quickly mature. In order to control by hoeing or scraping, it would be necessary to cut plants about once a week during the season of rapid growth. If the plants are allowed to become larger with the intention of burning them after hoeing, the seed pods or burs will scatter off as the plant is moved.

The road grader is effective in controlling many weeds but only serves to spread puncture vine for miles, placing the seeds in a most excellent mulch or seed bed, thereby affording ideal conditions for the next crop of puncture vine plants. The road grader may be successfully used only during a very brief period in the spring to destroy young seedlings; later it does more harm than good.

(Continued on page 9.)

DIVISION II MAINTENANCE MAN DEVISES OIL SPRAY

AN OUTFIT for fighting noxious weeds along the highways by spraying them with oil has been developed by Maintenance Superintendent E. L. Stump, stationed at Red Bluff, Division II.

The outfit, which uses waste crankcase oil, is reported effective in the campaign against noxious growths along the northern highways and for keeping down grass and weeds around guard rails. In the latter instances it cuts maintenance expense considerably.

Superintendent Stump describes his spray outfit as follows:

> The sprayer consists of a 50-gallon gasoline drum, mounted on sled runners and designed to be transported when in use in a Ford delivery body. The 2" plug in the top of drum was bored and a standard automobile tube air valve installed. The 2" plug in the end was removed and 2" pipe connections with 90 degree elbow installed for a filler pipe. At the bottom of the same end the 1" plug was removed and fitted with 1" pipe connection and gate valve. With a 1" to ¾" reducer, 20 feet of ¾" garden hose is attached with a spray nozzle on the end.
>
> The air is supplied constantly when in use by a spark plug pump as shown, which is capable of maintaining a pressure of about 20 pounds, when the outfit is running. With 25 pounds of air pressure the oil may be thrown about 15 feet, making a radius of action of 35 feet from the drum. The pressure is limited to 25 pounds. Waste crankcase oil from our own equipment is used, and also that collected from several oil companies near by, making the supply cost nil.

Cost of Outfit.

Labor	$5 00
Materials—	
50-gallon drum	-----
Spark plug pump (hand pump may be used)	5 00
10 feet ¼" air hose and connections	1 75
20 feet ¾" air hose	4 00
1 ¾" nozzle	75
1 1" gate valve	75
Total	$17 25

WEED EXTERMINATOR—Outfit devised by a Division II maintenance foreman for spraying noxious weeds with waste oils. The arrow points to an air pump operated by the motor after removing one of the spark plugs. Air is pumped through the pipe leading to the tank in the rear of the car which permits the use of the spray. Waste oils from crankcase flushings are used to effectively keep down roadside weeds. This is believed the most effective way to fight the puncture vine.

MOTOR VEHICLE FEES APPORTIONED TO STATE AND COUNTIES

IN ACCORDANCE with its policy of cooperation with county authorities, the California Highway Commission, in this issue of the *Bulletin,* is presenting complete data on the apportionment of the motor vehicle fees for the first six months of the present registration year. This information, no doubt, will be of value to supervisors and others interested in studying motor vehicle registrations.

The total registration, including exemptions and nonresidents, was 1,382,821 on August 1, 1925. The amount from motor vehicle fees received by the commission for maintenance and reconstruction of state highways was $2,728,158.52. A like sum, less salaries of traffic officers, was divided among the fifty-eight counties.

The registrations to date indicate the final total for the year will agree almost exactly with the estimate of the Committee of Nine, which was 1,490,000 vehicles, with an income to the commission from the fees paid of $3,450,000, the amount placed in the state budget. The next apportionment will be made in February, 1926.

Registration Tabulations.

The tabulations for the first six months of the 1925 registration period, as announced by the Division of Motor Vehicles, are as follows:

Statement of total number of fee paid registrations of automobiles, trucks, motorcycles, and trailers for the period February 1, 1925, to August 1, 1925:

County	Autos	Solid trucks	Pneumatic trucks	Motorcycles	Trailers
Alameda	82,420	2,776	10,045	1,010	653
Alpine	28	0	6	1	0
Amador	1,358	50	247	5	8
Butte	8,363	289	1,623	76	314
Calaveras	1,164	62	256	7	20
Colusa	2,855	109	680	14	114
Contra Costa	12,696	388	1,730	219	122
Del Norte	919	40	201	2	15
El Dorado	1,511	74	439	16	12
Fresno	38,891	1,587	5,013	316	1,553
Glenn	3,012	119	514	14	269
Humboldt	9,733	379	1,435	55	65
Imperial	12,159	353	3,004	37	240
Inyo	1,759	36	357	4	25
Kern	22,613	771	3,390	182	763
Kings	5,765	184	969	29	481
Lake	1,591	106	350	3	28
Lassen	2,719	53	385	16	18
Los Angeles	460,401	14,893	51,629	2,972	5,800
Madera	3,533	119	603	31	120
Marin	5,880	231	1,193	56	24
Mariposa	583	31	182	2	9
Mendocino	4,596	258	956	26	23
Merced	6,904	224	1,372	63	328
Modoc	1,188	21	198	3	8
Mono	200	4	40	1	1
Monterey	7,630	321	1,606	79	179
Napa	4,547	232	868	57	76
Nevada	1,822	51	418	10	19
Orange	28,757	588	3,345	256	1,137
Placer	5,211	212	1,212	57	82
Plumas	1,173	42	254	5	13
Riverside	15,625	323	2,745	145	759
Sacramento	27,566	1,219	5,025	322	672
San Benito	2,625	111	462	35	56
San Bernardino	24,561	599	3,668	262	721
San Diego	39,162	1,001	5,793	624	469
San Francisco	86,204	4,893	12,826	932	384
San Joaquin	22,468	932	4,294	257	905
San Luis Obispo	6,050	168	1,264	47	108
San Mateo	11,274	542	1,821	106	125
Santa Barbara	12,833	371	2,248	114	190
Santa Clara	30,836	1,339	4,438	455	1,087
Santa Cruz	8,224	388	1,704	103	102
Shasta	3,648	186	740	26	59
Sierra	458	9	97	1	5
Siskiyou	5,243	138	834	26	28
Solano	7,521	297	1,329	91	11
Sonoma	14,843	751	4,113	151	23
Stanislaus	14,869	425	2,481	180	108
Sutter	3,116	234	835	14	9
Tehama	3,161	104	645	25	19
Trinity	344	13	68	1	
Tulare	17,892	640	2,851	107	1,277
Tuolumne	2,165	55	324	12	9
Ventura	9,411	218	1,690	58	450
Yolo	5,318	297	1,266	56	230
Yuba	2,819	118	703	18	68
Totals	1,120,017	39,974	158,784	9,792	21,950
Exempt from fee	18,033	-------	-------	508	1,847
Dealers registered	11,260	-------	-------	171	66
Nonresident registrations	24,282				

Total number of motor vehicles, 1,382,821.

Apportionment of motor vehicle fees to counties for period beginning February 1, 1925, and ending July 31, 1925:

County	County share	Traffic officers' salaries advanced for first one-half year	Traffic officers' salaries reserved for second one-half year	Net apportionment
Alameda	$195,788 84	$325 20	$8,675 00	$186,788 64
Alpine	70 75	----------	----------	70 75
Amador	3,367 86	----------	----------	3,367 86
Butte	21,553 51	----------	2,275 00	19,278 51
Calaveras	3,050 48	----------	----------	3,050 48
Colusa	7,623 17	1,500 00	2,250 00	3,873 17
Contra Costa	30,626 12	1,015 00	7,125 00	22,486 12
Del Norte	2,377 32	1,224 20	1,153 12	----------
El Dorado	4,142 11	1,449 31	1,875 00	817 80
Fresno	95,304 84	6,605 65	5,500 00	83,199 19
Glenn	7,938 53	1,395 00	2,125 00	4,418 53
Humboldt	23,573 01	2,391 07	2,875 00	18,306 94
Imperial	31,897 66	4,329 34	5,500 00	22,068 32
Inyo	4,404 90	----------	----------	4,404 90
Kern	55,992 23	7,848 58	10,250 00	37,893 65
Kings	15,011 85	500 00	2,625 00	11,886 85
Lake	4,198 72	1,050 00	1,375 00	1,773 72
Lassen	6,448 66	1,400 00	1,500 00	3,548 66
Los Angeles	1,082,175 44	----------	----------	1,082,175 44
Madera	8,916 95	53 57	2,500 00	6,363 38
Marin	14,910 77	4,510 00	4,550 00	5,850 77
Mariposa	1,631 37	360 00	1,271 37	----------
Mendocino	11,836 03	2,368 28	3,875 00	5,592 75
Merced	17,959 24	5,350 00	6,000 00	6,609 24
Modoc	2,866 52	----------	----------	2,866 52
Mono	497 30	----------	----------	497 30
Monterey	19,821 06	264 55	5,500 00	14,056 51
Napa	11,674 31	1,280 00	2,275 00	8,119 31
Nevada	4,685 90	1,050 00	1,500 00	2,135 90
Orange	68,881 48	7,332 46	7,125 00	54,424 02
Placer	13,687 75	2,871 43	3,500 00	7,316 32
Plumas	3,006 02	----------	----------	3,006 02
Riverside	39,532 96	6,462 90	6,500 00	26,570 06
Sacramento	70,268 24	3,875 49	6,750 00	59,642 75
San Benito	6,646 78	3,010 17	2,275 00	1,361 61
San Bernardino	60,249 56	9,550 00	----------	50,699 56
San Diego	95,084 50	19,179 25	17,100 00	58,805 25
San Francisco	212,460 36	----------	----------	212,460 36
San Joaquin	58,286 66	6,872 90	6,125 00	45,288 76
San Luis Obispo	15,430 31	5,400 00	4,575 00	5,455 31
San Mateo	28,024 42	7,009 88	7,650 00	13,364 54
Santa Barbara	31,830 95	5,812 50	6,625 00	19,393 45
Santa Clara	77,096 96	8,935 00	9,500 00	58,661 96
Santa Cruz	21,260 39	----------	----------	21,260 39
Shasta	9,406 16	2,432 26	3,500 00	3,473 90
Sierra	1,146 21	----------	----------	1,146 21
Siskiyou	12,664 86	2,723 87	2,400 00	7,540 99
Solano	18,889 14	4,067 74	6,625 00	8,196 40
Sonoma	40,578 10	4,938 87	3,450 00	32,189 23
Stanislaus	38,455 49	4,246 66	4,975 00	29,233 83
Sutter	8,668 30	1,746 77	3,050 00	3,871 53
Tehama	8,326 66	4,050 00	3,625 00	651 66
Trinity	857 13	----------	750 00	107 13
Tulare	45,981 63	4,103 23	5,500 00	36,378 40
Tuolumne	5,179 15	1,200 00	1,000 00	2,979 15
Ventura	23,896 46	5,580 00	4,650 00	13,666 46
Yolo	14,484 23	1,619 16	3,325 00	9,540 07
Yuba	7,532 21	1,896 77	2,000 00	3,635 44
Totals	$2,728,158 52	$171,187 06	$205,149 49	$2,351,821 97

Apportioned to the California Highway Commission $2,728,158.52.

Road builders and vehicle manufacturers must cooperate in order that the roads shall be built to carry the vehicles and that the vehicles shall not overburden the road. Road building authorities of the Nation, the States, the Counties and the Municipalities must cooperate that the roads which know no political borders shall be properly coordinated.

—W. M. JARDINE, Secretary of Agriculture.

JOINING other state departments in supporting the 1925 State Fair, the California Highway Commission had a modest booth in the south balcony of the Horticultural Building. A large painting of the Douglas Memorial bridge and a relief map of California showing the state highway system, together with enlarged photographs and drawings illustrating reconstruction work, were features of the background. At the front, arranged by Research Engineer C. L. McKesson, was a comprehensive display of the work of the research and testing laboratory. The booth was designed and installed by E. M. Muse, of the laboratory staff. Secretary W. F. Mixon had general direction of the exhibit.

FIGHT PUNCTURE VINE

(Continued from page 7.)

Oil Spray Most Effective.

More recent investigations by the California Department of Agriculture have developed the fact that the only effective control for puncture vine is to destroy plants and seeds where they lie without unnecessarily disturbing them.

Various petroleum oils readily saturate the burs and destroy the seeds as well as kill the plants. Inasmuch as many of the seeds are found lodged just beneath the surface of the soil, it is necessary to drench the area well so that the oil will penetrate to some slight distance into the surface. It will be remembered, however, that these seeds are long-lived, and that from year to year some of them have been buried in the soil, both in fields and along roadsides. It can not be expected, therefore, that a single application will eradicate the puncture vine from any area, unless it is so thoroughly saturated that nothing will grow. In so far as railways and highway rights of way are concerned, this is not in any sense a deterrent factor.

It will be found rather expensive to attempt application of enough oil to penetrate the surface inch of soil unless the patches are small and scattered, which, fortunately, is still the case over a greater portion of the state. In those sections where puncture vine lines the roads and highways for miles, it will be found more economical to use a power sprayer similar to those used in orchard spraying, and apply a light application of distillate, or some of its modified forms, to the plant several times during the season. Use of distillate will tend to prevent other weed growth, which is decidedly advantageous.

The California Highway Commission is to be commended upon the steps it has taken to investigate methods for suppressing puncture vine and for the cooperation that it has extended to the county horticultural commissioners in their efforts to stem the ever increasing spread of this useless weed. The California Department of Agriculture and the county commissioners are ready to aid whenever possible.

MOTION PICTURES SHOW PRISON CAMPS

A reel of motion pictures showing the California prisons and road building activities with prison labor were shown to hundreds of visitors at the recent State Fair. The pictures were made by Pathe without cost to the state in connection with the preparation of a national release which will be announced soon.

The reel in the possession of the commission is available for use at community gatherings and elsewhere where an admission is not charged. Arrangements for its use may be made by communicating with the California Highway Commission.

RE-SIGNING OF CALIFORNIA HIGHWAYS NOT CONTEMPLATED

BECAUSE state and county highways in California are already well signed immediate steps are not contemplated to put into effect the system adopted recently in Washington by the Joint Board on Highway Markers. This is the announcement of State Highway Engineer R. M. Morton, a member of the board. To change the California system, worked out by the automobile associations and one of the most extensive in any of the states, would involve the expenditure of many thousands of dollars and would be an economic waste, it is pointed out by Mr. Morton.

It is hoped, however, that future road signing throughout the country will conform to the recommendations of the board and that eventually a uniform and country-wide system of warning and directional signs will result.

United States Highways.

About 60,000 miles of the federal aid system were selected for marking as the main trunk highways of the nation and this work, it is expected, will go ahead independently of the signing of other highways. The marker selected for designating these trunk highways is the shield of the United States in white on which will appear in black the name of the appropriate state, the letters "U. S.," and the route number. If possible the route numbers will be limited to two digits for easy reading. Steps will be taken to prevent the use of the standard marker for any purpose other than the marking of the selected system of interstate highways.

The highways in California recommended for designation as United States highways include the following routes:

> From San Francisco to the Oregon line (Redwood highway), including both the coast and Grants Pass connections with Oregon; from San Francisco to San Diego, via Los Angeles (coast route); San Diego to Tia Juana; Sacramento to Los Angeles through the San Joaquin Valley; from the Nevada line through Truckee, Auburn, Roseville, Sacramento, and Davis to Oakland; from Davis up the west side of the Sacramento Valley to Red Bluff and north to the Oregon line (Pacific highway); from Stockton to Oakland and San Jose; from San Diego to El Centro and eastward to Yuma (Borderland highway); from Los Angeles to San Bernardino and from San Bernardino to El Centro; from San Bernardino to Barstow, and from Barstow via Needles to Topoc.

COMMISSION UPHOLDS ACTION OF SOLANO COUNTY SUPERVISORS

AFTER a formal hearing at Fairfield, the county seat, on August 13th, the action of the Board of Supervisors in passing an emergency ordinance limiting loads on a Solano County highway was concurred in by the California Highway Commission. The hearing was demanded by the E. B. and A. L. Stone Company under section 88 of the California Vehicle Act. It is the first the commission has been called upon to conduct under the new vehicle act.

Supervisors testified that a reduction in the load limit on the county pavement, leading westward from Suisun, was necessary because of damage done by the hauling of heavy loads of rock, which is being removed from a quarry for building purposes. Repair work is under way.

Chairman Harvey M. Toy and Commissioner Nelson T. Edwards conducted the hearing, assisted by Secretary W. F. Mixon, Assistant State Highway Engineer T. E. Stanton and Paul F. Fratessa, attorney for the department.

Resolution Adopted.

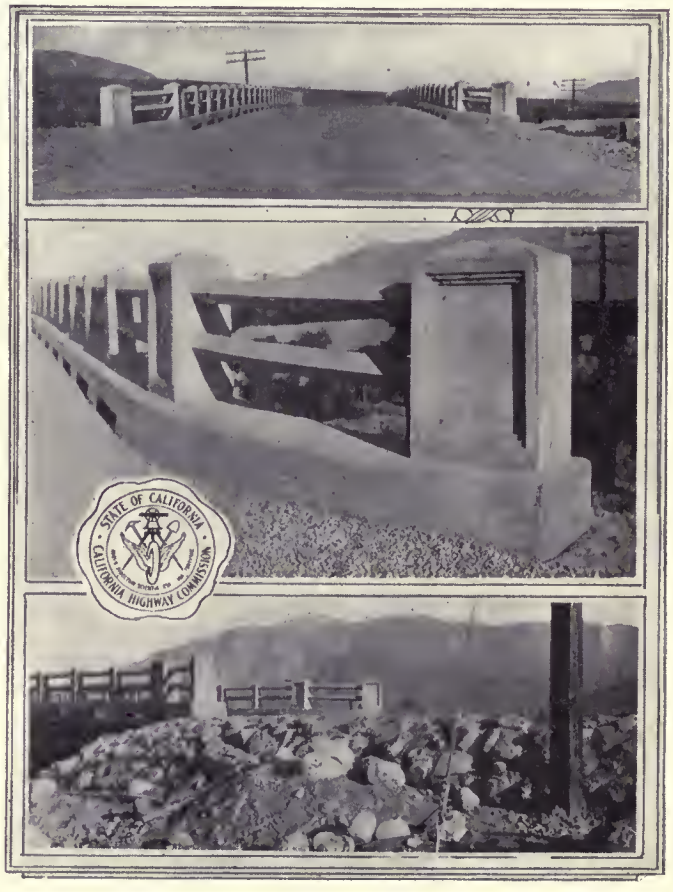
The action of the commission was expressed in the following resolution:

> WHEREAS, The protest of the E. B. & A. L. Stone Company, filed in opposition to the ordinance passed by the Solano County Board of Supervisors on July 6, 1925, relative to the weights of vehicles operating on Improved County Highway No. 76, was this day publicly heard and from the evidence adduced it is now voted that the California Highway Commission does hereby concur with the Board of Supervisors of Solano County and finds that it was necessary to reduce the load limits operating over said county road.

BRIDGE DEPARTMENT ISSUES MANUAL OF INSTRUCTIONS

A MANUAL of Instruction, containing 180 pages, has been compiled by the Bridge Department and is now being distributed to the department's engineers and employees throughout the state. Matters pertaining to field and construction work are covered in detail, with references to the manuals of the departments of Surveys and Plans and Construction, an effort having been made by the compilers to coordinate the Bridge Department manual with the instructions of the other departments.

Full page illustrations designed to help the field men make up the standard reports and forms are a feature of the book. Instructions relative to concrete mix are based on the so-called Abrams method, which the Bridge Department has been using for some time.



SAN GORGONIO BRIDGE—Another gap in the trunk highway leading to the Imperial Valley was closed recently with the opening of the new reinforced concrete bridge over the San Gorgonio Wash, in Riverside County. *Above*, the bridge; *center*, close-up of end post; *below*, type of riprap protection at end fills. (Bridge Department Photo.)

CUT RED TAPE APPEAL OF SURVEYS AND PLANS MANUAL

CUT THE RED TAPE of roundabout methods of making highway locations. This is the appeal of the new manual of instructions of the Department of Surveys and Plans, recently issued in printed form for distribution of location engineers and other field men.

"On public work the inclination is to disregard the short cuts and easy methods used in private practice," says the manual, "and to adopt longer, more roundabout and complicated ways, which not only increase the cost but delay the work. If the cost for public surveys is greater than that of private surveys it is because our methods have made it so."

It is urged upon the engineers that the important consideration is the employment of methods that will obtain the desired results, consistent with adopted standards, at a minimum of expense. Continuing, the manual, in its general instructions, reads:

> "The purpose for which the survey is to be made should be carefully considered and the character and detail of the survey operations should be consistent with the object to be obtained. Elaborate methods and multiplication of details add only to the cost and not to the usefulness of the final result. Existing data often can be worked up to supply the information required.
>
> "The relative importance of the road will govern the standards of alignment and grade to be adopted. Classification by its relation to the whole system, the service it will have to render and the traffic it will carry are all governing factors in making this determination."

HIGHWAY PLEASES JACKSON

THE people of Jackson, Amador County, recently raised, by popular subscription, a fund of $10,000 which was presented to the State Highway Commission with which to finance, in part, the grading of a section of the Alpine highway from Jackson, eastward. The commission has completed about three miles of new grade which is being surfaced with crushed rock. The total cost of the work, including engineering and surfacing, is about $37,000.

In an article in the Amador *Ledger,* giving details concerning the project and its costs, the Secretary of the Chamber of Commerce writes, in part, as follows:

> The traveling public, and all interested in better highways, are thoroughly pleased with the results. The contractor has done excellent work and the new highway is such an improvement over the former road that comparison of any sort falls short.
>
> Let it here be noted that the present California Highway Commission and its staff of engineers are doing important and valuable work along the entire route of the Alpine state highway.
>
> The people of this community have received excellent treatment from the commission. Let this treatment be here acknowledged and our sincere thanks extended to the commission, to Mr. McLeod, our Division Engineer, and to his entire staff.

BUREAU DISTRICTS CHANGED

EFFECTIVE in July, District No. 13 of the Bureau of Public Roads, headquarters at Phoenix, Arizona, was abolished and New Mexico placed in District No. 3 with Wyoming and Colorado, headquarters at Denver; while Arizona becomes a part of District No. 2 with California and Nevada, under C. H. Sweetser.

District Engineer E. S. Wheeler of former District No. 13 will be assigned to Hawaii, to which federal aid has recently been extended.

Only four states now remain without a tax on gasoline for motor vehicles. They are New York, New Jersey, Massachusetts and Illinois.

EEL RIVER BRIDGE REPAIR HAS INTERESTING FEATURES

PROTECTION of the pedestrian as well as the motorist is a duty of the California Highway Commission. The welfare of both was considered in the repair of the Eel River bridge, near Scotia, Humboldt County, which has just been completed.

This bridge was built a number of years ago when traffic was light and is but eighteen feet in width. Besides vehicle traffic, it is the only crossing for school children and for workmen employed in nearby lumber mills. The situation was corrected by building a four-foot sidewalk along one side of the bridge, as shown in the illustration.

Local Product Used in Repairs.

The deck of the bridge also was rebuilt and a redwood block pavement placed upon it. After all defective stringers of the deck had been removed, and the whole greatly strengthened, a 3-inch redwood floor was placed. A coat of asphalt was then applied and a 1-inch redwood floor laid diagonally. The latter was covered with roofing felt and waterproofing and upon this redwood blocks were placed.

These blocks are four by six inches, three inches in depth. They are placed in rows, with the grain perpendicular, and at a right angle to the traffic, breaking joints in each row. A 3/16-inch space was left between the rows and a quarter-inch space between blocks. These spaces were filled with asphalt and topped with sand. The combination of planking and blocks provides a smooth riding surface and reduces vibration to a minimum.

Interesting Traffic Marker.

The blocks placed in the center row were cut half an inch longer than the others and the edges beveled. This means of providing a traffic marker down the center of the bridge is an interesting feature of the improvement, which is expected to reduce maintenance on the bridge to a minimum. The redwood block pavement is the first so far used on the California highway system. It is an example of the economical use of local products.

Marin County shortly will vote upon a proposal to bond the county for $1,250,000 for the construction of a system of improved county highways.

SIDEWALK MAKES BRIDGE SAFE—New sidewalk on Eel River bridge at Scotia to protect school children and workmen who cross it daily. The bridge also has been improved with a new floor of redwood blocks especially treated. (Bridge Department Photo.)

WHAT THE DIVISIONS ARE DOING

DIVISION I.

HEADQUARTERS, WILLITS.

T. A. BEDFORD, DIVISION ENGINEER.

Counties of Del Norte, Humboldt, Mendocino, and Lake.

MAINTENANCE forces have begun extensive improvements on the McDonald-to-the-Sea highway, otherwise known as the Navarro River route, in Mendocino County. A gasoline shovel with several tractors are removing dangerous points and widening narrow fills.

Mendocino County is expending an additional $8,000 for grading a short section of this route to state standards and on the state highway location. The county expended $31,000 last year building sections of this road on the state highway location. These are now being maintained by the state.

With slide removal caused by last winter's heavy rains nearing completion, Division I already has been visited by the first of the fall rains.

DIVISION II.

HEADQUARTERS, REDDING.

H. S. COMLY, DIVISION ENGINEER.

Counties of Siskiyou, Modoc, Trinity, Shasta, Lassen, Tehama, and northern Plumas.

GRADING on the eleven-mile reconstruction contract in the Sacramento canyon, north of Halfway Creek, Shasta County, is progressing steadily. Grading is now about 60 per cent complete and about half the surfacing has been placed. The work remaining to be done is mostly away from the traveled sections of the highway and will interfere little with traffic. The contract should be finished shortly after January 1st.

When this contract is completed, twenty-four miles of the sixty miles between Redding and Dunsmuir will remain to be rebuilt. Surveys for this section have been completed.

Corning Paving Started.

Pouring of concrete for the paving of 1.5 miles of state highway through Corning, Tehama County, has been started and when completed will close one of the two remaining gaps in the Westside highway between Davis and Red Bluff. The city of Corning is cooperating in paving the street to full width for a considerable part of the distance.

Lassen County and the commission are each expending $5,000 for grading on the state location fifteen miles of the state highway between Constantia and Purdy, where the California highway joins the Nevada system. The rough grading has been completed for the entire distance and funds remain for finishing and ditching. A twenty-foot grade is being built. The work is being done by Lassen County under the general supervision of Maintenance Foreman Edwin Gribble.

DIVISION III.

HEADQUARTERS, SACRAMENTO.

F. W. HASELWOOD, ACTING DIVISION ENGINEER.

Counties of Butte, Colusa, El Dorado, Glenn, Nevada, Placer, southern Plumas, Sierra, Sutter, Yuba, and northern Sacramento and Yolo.

TO PROVIDE for winter travel, authority has been granted Division III to place one way surfacing on a three-mile section of the Colfax-Gold Run unit, in Placer County, now under construction. C. R. Adams, contractor, has the work about 85 per cent completed and is operating two power shovels three shifts.

Slow progress is being made by the contractors on the grading project between Boca and Floriston, in the Truckee River canyon. The road is reported 85 per cent complete. A half mile of rough grading and about two miles of finishing remain to complete the road.

Beyond Floriston, the Nevada Contracting Company has two power shovels in operation in the race to complete the road to the Nevada line.

The Williams, Giddings and Whyte contract for grading and surfacing a section of the Tahoe-Ukiah highway, in Colusa County, has been extended to include a section within the town of Williams and also a section at the westerly end of the project. The work is now about finished.

North Sacramento Paving Starts.

The Kaiser Paving Company has begun paving operations between the American River and North Sacramento where a thirty-foot concrete pavement will be placed. Construction of two underpasses on this section is progressing rapidly.

Clearing has been completed and grading operations are now under way on the Camino-Sportsman's Hall contract, east of Placerville. A land leveler and two tractors are being used to construct the new grade.

New Convict Camp Soon.

Building of a camp near Rumsey, Yolo County, will begin soon to house the Folsom prison crew, ordered transferred to the Rumsey-Lower Lake highway.

Bishop and Brooks, contractors, have a rock crushing plant in operation and have completed several miles of the surfacing contract at the north end of Lake Tahoe.

Maintenance forces are completing the improvement of the Auburn-Colfax, Placer County, section by the placing of a seal coat of asphalt and screenings to prevent raveling of the surfacing. It is expected maintenance costs on this section will be materially reduced as a result of the improvement.

Between Forebay and Emigrant Gap, placing of crushed rock surfacing has been authorized. The rock will be crushed on the job by state forces. West of Soda Springs, surfacing is now being placed by a maintenance crew, and between Donner Lake and Truckee similar work has been authorized to be financed with maintenance funds.

MAINTENANCE STATIONS—*Above*, a Division VI station on the trunk line in Kern County; *below*, home of a foreman on the Pacheco Pass Highway, Division IV.

DIVISION IV.

HEADQUARTERS, SAN FRANCISCO.

JOHN H. SKEGGS, DIVISION ENGINEER.

Counties of San Francisco, Marin, Sonoma, Napa, Contra Costa, Alameda, Santa Clara, Santa Cruz, and San Mateo.

BORING of test holes to determine the character of soil which will be encountered in constructing the foundations of the proposed underpass at South San Francisco, on the Bay Shore highway, have been completed by Division IV and the results submitted to the bridge department at headquarters.

Contractors engaged in building a grade for the initial section of the Bay Shore highway are now working three shifts daily and are making good progress.

Pouring of concrete on the second story concrete job between Santa Rosa and Healdsburg, on the Redwood highway, Sonoma County, is now well under way. Work started in the vicinity of Windsor, where a central proportioning plant has been erected. Detours around the work are being kept in good condition.

Widening work under way between the cemeteries and San Bruno, on the Peninsula highway, is progressing rapidly. Concrete shoulders will be placed prior to resurfacing of the old pavement with asphalt concrete. The final width will be forty feet.

Track Removal Expected.

Negotiations for the removal of the railroad tracks in the vicinity of the cemeteries is progressing and there is reason to believe widening of this section can be undertaken in the near future.

Fair progress is reported by the Kaiser Paving Company on the widening work being done between San Pablo and Tormey, in Contra Costa County. The width of the new pavement is thirty feet. Detours around this work have now been discontinued.

J. P. Holland is now making rapid progress on his grading contract on the Skyline boulevard. A passable trail has been broken through to the La Honda road.

DIVISION VI.

HEADQUARTERS, FRESNO.

J. B. WOODSON, DIVISION ENGINEER.

Counties of Fresno, Madera, Merced, Mariposa, Kings, Tulare, and Kern, north of the Tehachapi.

THE Folsom Prison Camp is rapidly completing the grading of an eight-mile section in the Kern River canyon and preliminary arrangements have been made for its transfer to the Rumsey-Lower Lake highway, in Yolo County.

The three reconstruction and widening jobs under way in the San Joaquin Valley have been extended to include placing of two-foot gravel shoulders on either side of the new pavement. All of the new pavement is twenty feet in width, exclusive of the shoulders.

Grading of the approach to the Yosemite National Park, through the Merced River canyon, is progressing at a rapid rate and opening of the road early next summer is confidently expected. The work is being done by San Quentin prisoners.

DIVISION VII.

HEADQUARTERS, LOS ANGELES.

S. V. CORTELYOU, DIVISION ENGINEER.

Counties of Los Angeles, Ventura, Orange, San Diego, and eastern Kern, south of Mojave.

OVER three miles of pavement have been completed on the Jahn and Bressi contract for reconstruction of 5.6 miles of highway between San Juan Creek and Galivan, in Orange County. The same contractor has the grading well under way on the stretch of highway north of Oceanside.

Grading is progressing rapidly on the San Onofre-San Mateo Creek line change, in San Diego County.

On the Montebello-Whittier widening contract, Los Angeles County, curbs and gutters have been completed and the pavement is being placed.

Kavanagh and Twohy, contractors, have begun work on the paving of the Coast boulevard between Laguna Beach and Newport Beach, in Orange County.

Grading on the same route through the Malibu Ranch, Los Angeles County, has been completed from Las Flores Canyon to Malibu Creek. At Ramirez Canyon, a twelve-foot arch culvert has been completed.

DIVISION VIII.

HEADQUARTERS, SAN BERNARDINO.

E. Q. SULLIVAN, ACTING DIVISION ENGINEER.

Counties of San Bernardino, Riverside, and Imperial.

UNLIKE most of the other divisions, the Division VIII construction program will be at its height during the winter months, as the heat of the summer makes difficult continuous construction on the desert highways.

Work is starting on three grading projects on important interstate connections. H. G. Fenton is grading 25.74 miles from Victorville to Hicks, San Bernardino County; S. Y. Faucett is starting work between El Centro and Holtville, Imperial County; and Norman B. Conway is at work between Holtville and the East Highline Canal. Each of these contracts call for grading and surfacing with crushed rock.

County Pavement to be Rebuilt.

Widening of the highway to twenty feet between Edom and a point near Indio, Riverside County, on the Imperial Valley trunk highway, is under way. "Flush" concrete shoulders will be placed by Basich Brothers.

The contract for repaving the county highway, between Redlands and San Bernardino, 5.49 miles, with "second story" concrete to a width of twenty feet, has been awarded to the same firm and the work is well under way.

Plans have been forwarded to headquarters for the grading of two sections on the Mecca-Blythe highway, in Riverside County; one near Blythe, and the other east of Shaver's Well.

DIVISION X.

HEADQUARTERS, SACRAMENTO.

J. C. McLEOD, DIVISION ENGINEER.

Counties of Amador, Calaveras, Alpine, Tuolumne, Stanislaus, San Joaquin, Solano, and southern Sacramento and Yolo counties.

THE Turner Station-Stanislaus County line paving project, in San Joaquin County, is progressing rapidly. Placing of concrete from Manteca south to the county line has been completed

(Continued on page 15.)

ONE MAN MAINTENANCE OUTFIT—McCormick-Deering industrial tractor in service on the Black Point cut off, Sonoma County, Division IV. This machine pushes an eight-foot grader and pulls a five by seven-foot drag.

STATE HIGHWAY FUND CONTRACTS (Bond Funds, Including Federal Aid)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE AUGUST 14, 1925.						
414	VII	Ventura-Los Angeles	60	A	Hueneme Road to Rindge Ranch	11.44	Grade and Gravel	Hauser Construction Co.	$890,500 00	Dec. 19, 1922	------
452	II	Lassen	28	A	Pit River Main and Overflow Channels	------	Seven Bridges and Weir	Horn, Hart and Savage	56,325 98	Sept. 15, 1924	------
464	VIII	Riverside	26	C	Across San Gorgonio Wash	------	Reinforced Concrete Bridge	DeWitt and Morine	18,993 38	Mar. 12, 1925	------
					AWARDED SINCE AUGUST 14, 1925.						
480	X	Yolo	6	C	Sacramento Northern Railroad	------	Underpass	Lord and Bishop	$24,052 05	Sept. 3, 1925	125
481	IV	San Mateo	55	A, B, C	Northerly Boundary to Kings Mountain Road	------	Guard Rail	Samuel A. Martindale	9,112 50	Sept. 3, 1925	60
					Sub-total	------			$33,164 55		
					PENDING AWARD.						
------	VII, VIII	San Diego-Imperial	12	H, A	Mountain Springs Grade to Myers Creek Bridge	1.90	Grading		56,193 75		
					Total State Highway Fund Contracts Awarded and Pending Award	1.90			$89,358 30		

NOTE—Primary construction covered by the above contracts does not include funds obligated on cooperative forest highway projects, prison road camp activities, or day labor jobs not being done under contract.

STATE HIGHWAY MAINTENANCE FUND CONTRACTS (Including Gasoline Tax Fund)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE AUGUST 14, 1925.						
M-71	I	Humboldt	1	E	Eel River Bridge	------	Sidewalk	Henry Padgett	$19,890 00	April 15, 1925	------
M-76	VII	Los Angeles	4	A	Various	------	Painting Four Bridges	D. E. Burgess	7,882 03	May 4 1925	------
					AWARDED SINCE AUGUST 14, 1925.						
M-98	III	Sacramento	3	B	American River to Globe Iron Works	.42	P.C. Concrete Pavement	Kaiser Paving Co.	$29,140 31	Sept. 3, 1925	75
					PENDING AWARD—None.						
					Total State Highway Maintenance Fund Contracts Awarded and Pending Award	.42			$29,140 31		

NOTE—The above obligations charged against the State Highway Maintenance Funds do not include funds from these sources obligated for general maintenance and for specific betterments being done under day labor authorization.

DIVISION REPORTS

(Continued from page 13.)

and the contractor is now working northward toward Turner Station. The municipality of Manteca is cooperating with the commission in the paving of its business street full width.

Grading of three miles of new highway easterly from Jackson, in Amador County, has been completed and Contractor R. N. Murdoch is now engaged in placing gravel surfacing for the full length of the new grade.

Yolo Paving Completed.

Placing of concrete on the widening work in Yolo County has been completed by the Kaiser Paving Company and completion of the job by placing rock shoulders is now under way.

The Central California Traction Company is now engaged in moving its tracks to the center of Stockton boulevard, at the southern city limits of Sacramento, and completion of the paving of this entrance to the city will be under way within the next few weeks.

Division X has treated several miles of earth and gravel shoulders in San Joaquin County with fuel oil with gratifying results.

Graveling of the state highway between Ione and Jackson by maintenance forces, has been completed.

Extension of all culverts between Cordelia and the Yolo County line has been completed.

The appearance of the highway between Batavia, Solano County, and Washington, Yolo County, opposite Sacramento, has been greatly improved by the grading of shoulders and cleaning of the roadside. Maintenance Superintendent B. W. Bicksler has been in charge.

BRIDGE DEPARTMENT NEWS

HARLAN D. MILLER, Bridge Engineer.

PRELIMINARY plans for an underpass under the tracks of the Southern Pacific railroad on the Bay Shore highway at South San Francisco, have been completed and filed with the Railroad Commission together with an application for an order directing the construction of the grade separation and an assessment of the cost. The structure will be the largest of its kind on the state highway system.

Specifications have been completed for one of the five bridges necessary to complete the Merced River highway into the Yosemite Valley and work has been started on the preparation of plans for the other structures. Building of the five bridges has been authorized by the commission.

Grade Separation in South.

Work has been begun by the Union Pacific railroad on an underpass grade separation where its lines cross the Whittier boulevard, east of Montebello, Los Angeles County. The work involved raising of the tracks of the railroad at this point. The state, county, and the railroad are participating in the cost of the separation.

Seven bridges across Pit River and its overflow channels on the Alturas lateral, through Big Valley, Lassen County, have been completed and accepted. They eliminate twenty-three county-built wooden structures.

Good progress is being made on the North Sacramento underpasses and work is starting on the West Sacramento grade separation. Lord and Bishop have all three contracts.

HIGHWAY NEWS NOTES

DIVISIONS I and II were honored recently by a visit from Governor Friend W. Richardson, Chairman Harvey M. Toy and Commissioner Louis Everding. They were accompanied on an inspection trip over the Redwood and Pacific highways by State Highway Engineer R. M. Morton. The Modoc and Lassen laterals were included in the trip.

J. G. Standley, assistant division engineer at Redding, is the proud father of Miss Mary Alice Standley, a recent arrival.

Gets the First Buck.

Honors for bringing the first buck of the season into Redding went to E. N. Babb, chief clerk, Division II.

H. B. La Forge is now resident engineer on the widening work under way on the west shore of Lake Tahoe. C. C. Buckman is acting in a similar capacity on the graveling contract along the north shore.

W. F. Faustman of Division III enjoyed a vacation recently in the Russian River and Clear Lake districts.

S. T. Corfield, assistant division engineer at Fresno, enjoyed a vacation this year in the north coast Redwood country.

George L. Lisher and William E. Riggs are new assistant resident engineers in Division VI.

Engineers Resign.

R. D. Spencer and L. W. Aldrich have left Division VIII to join the forces of the Los Angeles city engineer's office.

Howard Noble is resident engineer on the big Victorville to Hicks grading contract in Division VIII.

T. R. Goodwin is in charge of the Holtville-El Centro grading contract.

Fred J. Grumm from headquarters and Division Engineer J. C. McLeod and their families are among the highway folks who enjoyed the Capitola beaches this year.

Assistant State Highway Engineer T. E. Stanton and family vacationed in southern California this year.

Edgar W. Zumwalt and W. W. West of Division X and their families motored through the northwest during the summer, probably inspecting some of the roads built by their chief before he came south.

Miss Fern Dunkeson, of the construction department office, took a vacation recently and returned to the office as Mrs. Leland S. Sweet. Best wishes, Fern.

A sudden illness took from the accounting department Oscar Dull, who passed away at the Sutter Hospital early in the month.

Department Has Party.

A happy event of the summer for the Purchasing Department was a picnic and swimming party one evening at historic Mormon Island above Folsom. H. L. Mahoney and Fred Seymour were invited guests. Others present were Mr. and Mrs. L. R. Smith and family, Mr. and Mrs. Walter Bumgart, Charles Thorp, Lawrence Lumley, Misses Charlotte Barnes and Hermine Miller.

News From the South.

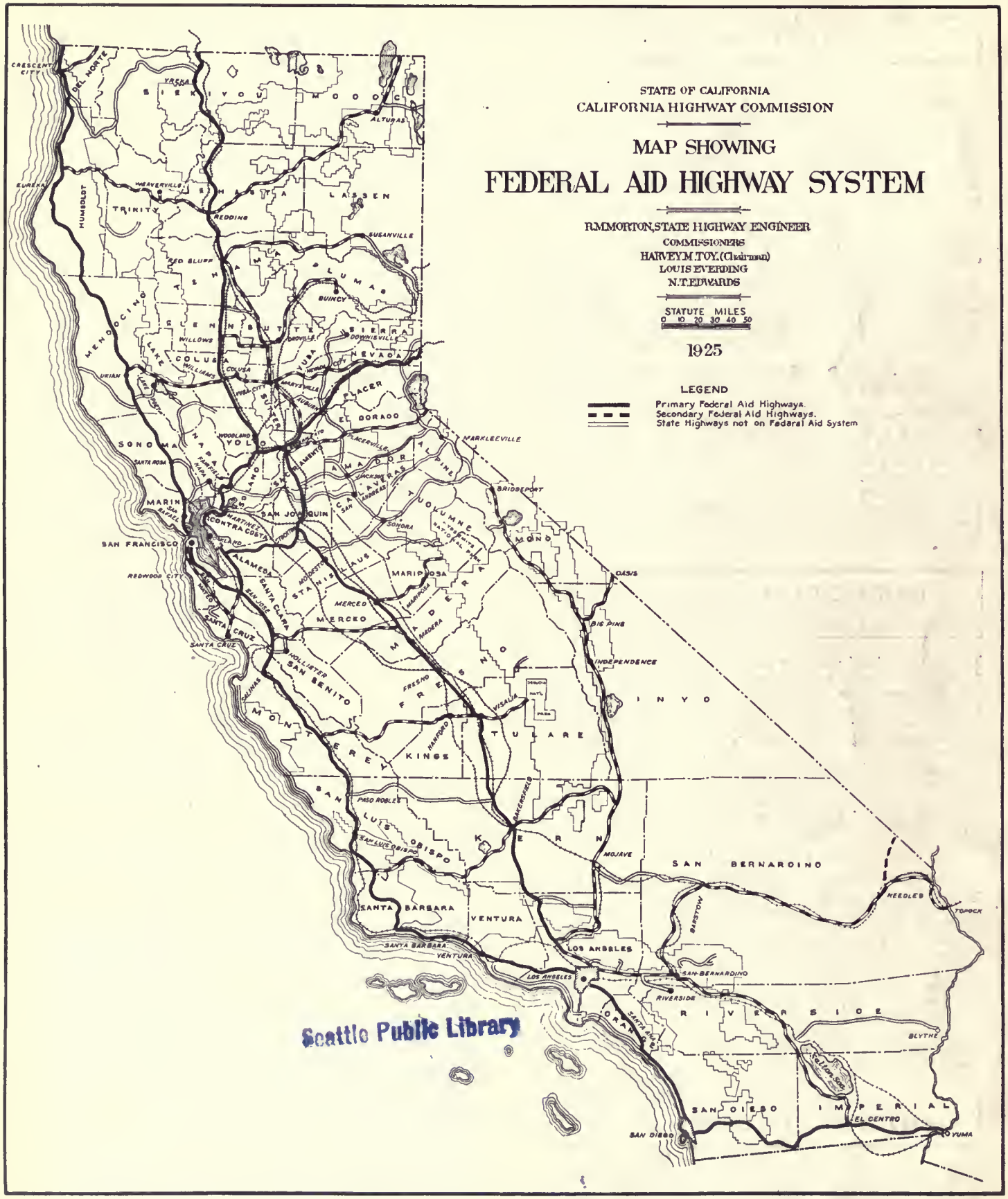
S. V. Cortelyou, division engineer at Los Angeles, has returned with his family, from a vacation trip to Seattle.

R. L. Thomas, formerly with Division I, is now resident engineer on the Newport Beach-Laguna Beach paving contract.

Herald Davis and Walter Lamb have been assigned as assistant resident engineers on the San Juan and Whittier boulevard jobs, respectively.

The construction of highways will be the most active American industry in 1925, is the prediction of Roger W. Babson, the economist. Through a study of financial conditions, the comparisons with past years tabulated and graphically drawn up on paper, Mr. Babson scientifically looks into the future.

MRS. MIXON RUNS THE SHOVEL—Secretary and Mrs. W. F. Mixon view the Bureau of Public Roads forest project where a splendid highway is being built through the Yuba Pass, Sierra County, and, at the invitation of the contractor, try operating the big power shovel.



Seattle Public Library

The above map shows the federal aid highway system of California in its relation to other state highways. The roads shown on this map constitute the present state highway system, except in one or two minor particulars where the federal aid system includes short sections not designated state highways.

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CALIFORNIA HIGHWAYS

A BULLETIN ISSUED BY THE CALIFORNIA HIGHWAY COMMISSION FOR THE INFORMATION OF ITS EMPLOYEES AND THE PUBLIC

Vol. 2 OCTOBER, 1925 No. 10

THROUGH THE PINES—View on a recently completed section of the Red Bluff-Susanville lateral in Lassen County. A wide, rock surfaced highway on good alignment serves the land of Peter Lassen.—Thompson Studio, Susanville, photo.

In this issue: THE FIRST OF A SERIES OF INTERESTING ARTICLES PRESENTING RESULTS OF WORK OF THE RESEARCH DEPARTMENT.

CALIFORNIA HIGHWAYS

HARVEY M. TOY, Chairman;
N. T. EDWARDS and LOUIS EVERDING, Commissioners.

ROBERT M. MORTON, State Highway Engineer.

W. F. MIXON, Secretary.

We are pleased to permit publication of any of the matter contained herein or to loan cuts and this privilege is extended newspapers and periodicals without restrictions.

FRANK B. DURKEE . . . Editor
P. O. Box 1103, Sacramento, California.

Vol. 2. OCTOBER, 1925. No. 10

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CALIFORNIA HIGHWAY DEPARTMENT

CALIFORNIA HIGHWAY COMMISSION

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BEN H. MILLIKEN, Superintendent of Convict Road Camps

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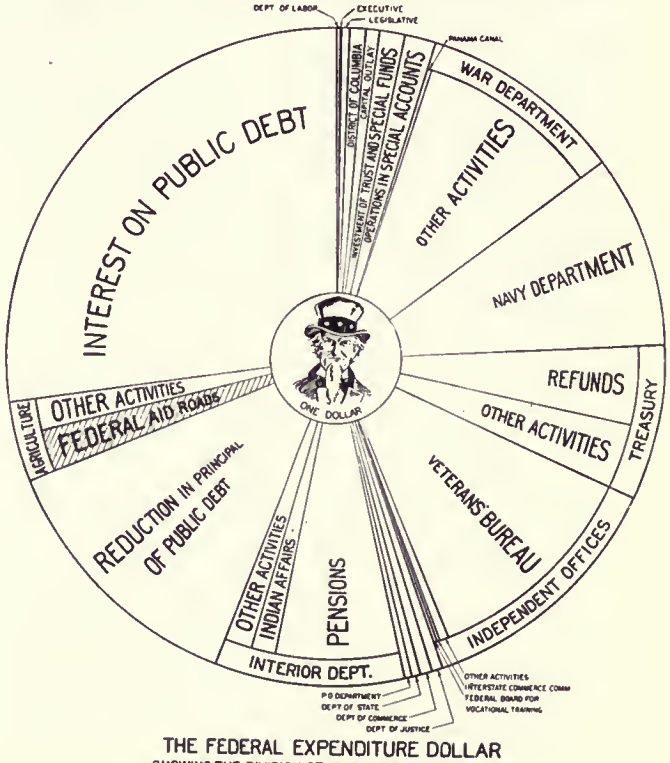
E. Q. SULLIVAN (Acting), Division VIII, San Bernardino
F. G. SOMNER, Division IX, Bishop
J. C. McLEOD, Division X, Sacramento

General Headquarters, Fifth Floor, Forum Building, Sacramento

"MAKING OF GOOD ROADS."

But I can see no merit in any unnecessary expenditure of money to hire men to build fleets and carry muskets when international relations and agreements permit the turning of such resources into the *making of good roads,* the building of better homes, the promotion of education and all the other arts of peace which minister to the advancement of human welfare.—*From the address of President Coolidge before the National Convention of the American Legion.*

ONLY 2.3 CENTS SPENT FOR ROADS



THE FEDERAL EXPENDITURE DOLLAR
SHOWING THE DIVISION OF THE FEDERAL EXPENDITURE FOR THE FISCAL YEAR 1924
AS REPORTED BY THE BUDGET BUREAU

UNCLE SAM'S TAX DOLLAR—Federal aid for roads gets 2.3 cents out of every 100. Look at the diagram and try and find another federal expenditure that is contributing more directly and to a greater degree to the progress and prosperity of the nation. Will it be real economy to discontinue this 2.3 cents for roads?

OCTOBER 1925

California Highways

VOL. 2 NO. 10

WILL THE FEDERAL AID PROGRAM BE CONTINUED?

(From New Hampshire Highways.)

TO CURB our present progress in road construction as some trouble makers would have us do would be a national calamity, for who pays for the waste resulting from poor roads? There is but one answer, the cost as it affects each producing individual is passed on to the consuming public. Therefore, each of us contributes his share to this preventable waste.

Thomas B. MacDonald, Chief of the United States Bureau of Public Roads, has truly said: "The use of the principal highways is so extensive that the people pay for adequate highways whether they have them or not and they pay less if they have them than if they have not."

Why this opposition to federal aid? Simply this: the willingness of the American people to accept thoughtless criticism and their unwillingness to ascertain all the facts concerning recent highway development. The federal aid highway program is a work too tremendous and too far reaching for the American people to stand idly by while its wrecking is accomplished by a few political critics who base their arguments on an alleged invasion of "state rights," unfair competition against the steam railroads or unequal taxation, since the bulk of income taxes is collected in a few cities like New York, Chicago or Boston and a proportion of this revenue is directed toward highway improvement.

It has also been argued that federal aid in highway construction is unnecessary and road building is up to the various communities through which the roads pass. Before the general acceptance of the motor vehicle as a means of public transportation, this statement would have been an accepted fact but now that the motor vehicle is depended upon for the transportation of the public as well as many of the commodities that are essential for the public welfare, the building of interstate highways must not and can not be left to the whims of local political leaders.

FIELD STUDY TO COORDINATE MAINTENANCE WORK

(An announcement by Mr. Morton.)

MAINTENANCE Engineer G. R. Winslow has detailed R. S. Badger to field work as representative of the Headquarters Maintenance Department. Mr. Badger will study in each division the various features of maintenance. His duty will be to examine methods in use by especially efficient foremen and take steps to introduce them, where adaptable, to other divisions.

It is the intention of the maintenance engineer that the maintenance men in each division shall be kept fully informed of the methods employed in other parts of the state. They will be invited to discuss with Mr. Badger the relative efficiency of the various materials and equipment. This interchange of ideas between the various maintenance units of the ten divisions should encourage the adoption of the best methods throughout the state.

Many Problems to be Considered.

Many maintenance problems are not yet satisfactorily solved. For example, the prevention of washouts on mountain roads is now handled by various methods in different divisions. The most suitable grades of asphalt are not always chosen for patching work in each locality. The distribution of suitable equipment is an ever present problem. The solution of these and other matters will be sought by Mr. Badger.

No phase of state highway activities is so important as maintenance. It is the feature of the work which comes continually to the attention of the public. Mr. Badger should have the cooperation of all maintenance employees, for the scope and difficulties of his assignment are great.

STATE MAKES IMPROVEMENTS ON GENERALS' HIGHWAY

THE RECENT dedication by the National Park Service of that section of the Generals' highway within the Sequoia National Park serves to call attention to the extensive improvements on this route completed recently by the California Highway Commission. The Generals' highway leads from the San Joaquin Valley trunk highway at Visalia, Tulare County, easterly through the beautiful Lemon Cove and Three Rivers orange districts into the Sequoia National Park. Eventually, it will be extended to a connection with the General Grant National Park, thus connecting the General Sherman and General Grant sequoias, the largest living trees in the world.

The section from Visalia to the Sequoia Park boundary is thirty-seven miles in length. It was added to the state highway system by the bond issue of 1919 and taken over by the highway commission in January, 1923. Previous to its acquisition by the state, that portion of the highway between Visalia and Three Rivers, thirty-one miles in length, was paved by Tulare County with cement concrete. The remaining six miles from Three Rivers to the park boundary was graded and surfaced in 1923 by the state.

Original Grade Widened.

Not anticipating the increase of traffic into the Giant Forest region which would result from the building of better highways, that section of the county pavement between Lemon Cove and Three Rivers was placed on a narrow and crooked grade altogether inadequate as a park entrance. Since its acquisition by the state, $27,000 has been expended in straightening curves and grade widening and for the improvement of drainage, as shown in the illustrations. Other minor improvements have been made in connection with general maintenance. When funds are available, additional reconstruction will have to be done before the road can be considered finished.

The six miles of grading completed in 1923 was built upon high standards at a cost of $156,400. The section has been surfaced with decomposed granite and excellently maintained, a permanent maintenance station having been established at Lemon Cove, where a maintenance foreman's cottage and storage warehouse for equipment have been erected.

(Continued on page 6.)

BRIDGE DEPARTMENT CONDUCTS INTERESTING TEST—LUMNITE CONCRETE PILE DRIVEN 24 HOURS AFTER CASTING

By Harlan D. Miller, Bridge Engineer.

AN INTERESTING test, which may prove of great value in reinforced concrete pile foundation construction, has just been completed by the bridge department at Pismo, San Luis Obispo County, where two state highway bridges are under construction. A concrete "test" pile was cast using Lumnite cement instead of ordinary Portland cement. Twenty-four hours after the pile was cast it was driven forty-five feet in the ground to refusal. The test was one of the first made by the California Highway Commission with this special cement.

In this instance Lumnite cement seems to have developed, at twenty-four hours, a greater strength than most Portland cements at twenty-eight days. It requires about the usual time to "set," but, after "setting," Lumnite develops maximum strength very rapidly. One of its principal raw materials is aluminum ore.

Great Strength Developed.

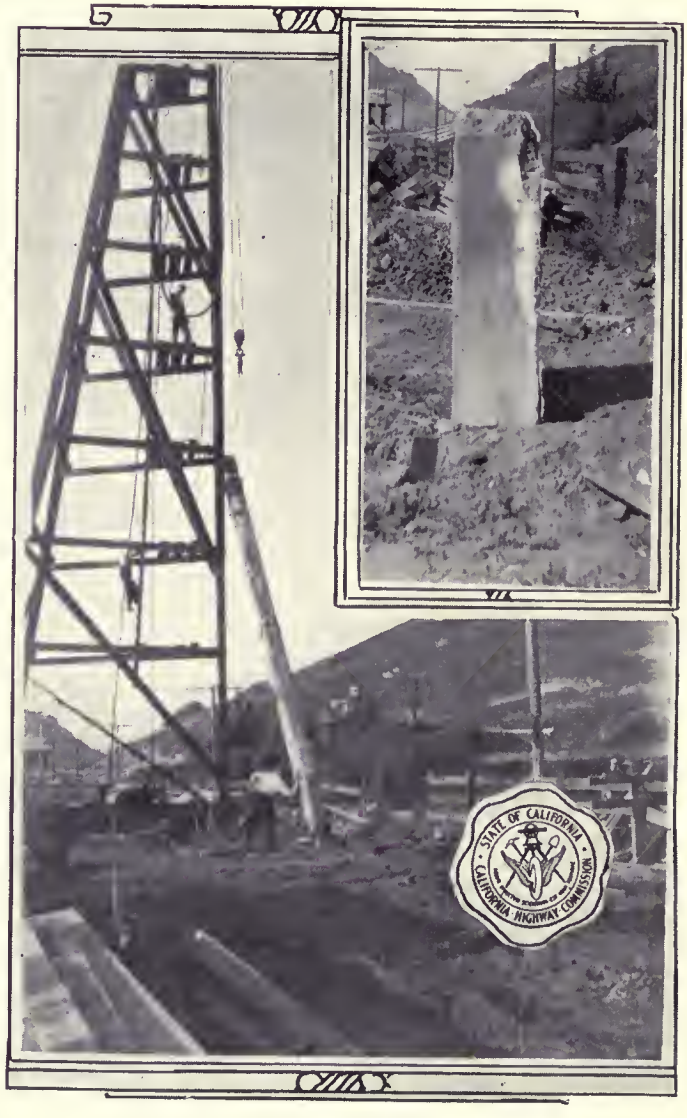
It was not possible to have made a strength test of the concrete used in the pile at the age of twenty-four hours, but two 6 x 12-inch sample cylinders of the concrete were tested within forty-eight hours after casting. The 200,000-pound state testing machine did not break either of the test samples, indicating a strength in excess of 5,600 pounds per square inch. This test concrete, after forty-eight hours, had a strength at least equal to ordinary Portland cement concrete at an age of three months.

A number one Vulcan steam hammer was used to drive the test pile, which was forty-seven feet long and eighteen inches square. The usual time of curing before driving concrete piles is tyenty-eight days, but the pile used at Pismo was driven exactly twenty-four hours after casting. It required 643 blows of the hammer to drive the pile forty-five feet in the ground to refusal. The pile apparently was not injured in any way by the rough treatment to which it was subjected, except that under the blows of the hammer there was a little spalling at the top.

Value of Test.

The value of a test of this kind is obvious. In the future, whenever concrete piling is to be used in the construction of bridges or other structures, a "test" concrete pile can be driven on short notice and exact conditions determined upon. This is not always possible with wooden test piles, which are generally used to obviate waiting twenty-eight days for a concrete pile to cure. Wooden test piles are sometimes unsatisfactory because of the difference in size and penetrating power. The driving of such test piles frequently gives the wrong impression, and concrete foundation piles are cast an improper length as a result.

The use of a concrete pile as a "test" pile is a true guide for determining the proper length for other concrete piles. This experiment of the bridge department may be the means of effecting a considerable saving in the future.



CONCRETE TEST PILE—Hoisting a concrete test pile twenty-four hours after casting at Pismo bridge site; *inset* the pile after being driven to refusal by 643 blows of the hammer. Lumnite cement was used for the experiment. (Photos by Bridge Department.)

MEETING OF WESTERN OFFICIALS

AT SAN FRANCISCO on November 9th and 10th, and in conjunction with the All Western Road Show, will be held the annual meeting of the Western Association of State Highway Officials. This meeting was called by President Geo. W. Borden of Nevada, and is being held for the purpose of discussing mutual problems, the future of federal aid and other matters. This western association is the official organization of the executive officers of the highway departments of the eleven western states and in the past has accomplished much in the way of federal aid legislation and uniform policies of procedure among the states.

Drill 'em Out.

TWO colored convicts who were anticipating a fight prefaced the bout with the following preliminaries:

"Colored boy, ah comes from a tough breed; my ole man used to manicuih his nails wif a meat axe, an bresh his teef wif a file."

"Hell, that aint nothin'," said the second one. "My ole man was so tough he shaved hisself twiced a week with a jack-hammer."

In one of the convict camps there is a radio, and No. ------ of the audience, who was qualified to know from previous musical experience in Sing Sing, said: "Why that piece is two strikes for the wop."

"What d'ye mean?"

"Oh, the Second Hungarian Rhap sody."

INVESTIGATION OF REASONS FOR DIFFERENCE IN STRENGTH OF CONCRETE FROM TWO PAVING PROJECTS

By C. L. McKesson, Testing and Research Engineer.

The testing laboratory has under way and has completed in recent months a number of important research investigations, which undoubtedly will be of interest not only to the engineers of the department but to others engaged in the building of highways. Reports of these investigations are being prepared and one or more will be published monthly in the Bulletin. The first of these reports appears this month.

State Highway Engineer.

THE highest average strength of field concrete from a California paving project, laid and tested during the season of 1924, was about 5000 pounds. The lowest average strength from a project built during the same season was about 2700 pounds. On each project, the same amount of cement per cubic yard was used.

Believing a study of the reasons for this wide variation in strengths would be of value in connection with efforts of the department to produce uniformly good concrete, liberal samples of materials used on each project were secured and a complete series of laboratory tests, which seem most illuminating, have been completed.

In the following report of this research the paving project having the higher strength will be designated as Number 1, and the one with the lower strength as Number 2. Materials used on the two projects likewise will be designated by the same numbers; Sand Number 1, Gravel Number 1, and Cement Number 1 being those used on project Number 1, and Sand Number 2, etc., referring to the materials used on the lower strength project Number 2.

The projects were many miles apart and all of the materials were from different sources. All of the materials, however, tested within our specification limits and therefore were acceptable.

Many Investigations Necessary.

To remedy defects in the design of concrete, the various elements must be investigated, one at a time. Therefore, in this series of tests, specimens were made using cements and aggregates in all possible combinations in order to show clearly the variation in strength due—

1. To the difference in the quality of the sand.
2. To the difference in the quality of the gravel.
3. To the difference in the quality of the cement.

In mortar tests, Number 1 sand, as used in the paving work, gives a strength ratio of 123. Number 2 sand, used as in pavement, had a strength ratio of 104. This difference in strength ratios is reflected in the tests of concrete, as shown in the following table:

TABLE 1.

Variation in strength of concrete due to difference in quality of sand.

Made with	No. 2 Sand	No. 1 Sand	Pounds No. 2 weaker than No. 1
No. 2 Cement, No. 2 Gravel	3141	3382	241
No. 2 Cement, No. 1 Gravel	3431	3739	308
No. 1 Cement, No. 2 Gravel	4202	4438	236
No. 1 Cement, No. 1 Gravel	4260	4711	451
Average	3760	4070	310

Number 2 gravel, partly crushed, recorded a loss of 19 per cent in the shot rattler. Number 1 gravel, not crushed, in the shot rattler shows a loss of 10.2 to 11.5 per cent. A somewhat higher rattler loss is expected with partly crushed gravel, but the test indicates that Number 2 gravel is somewhat weaker than Number 1 gravel. That there is a difference in strength of concrete made with each gravel, is apparent from the following table:

TABLE 2.

Variation in strength of concrete due to difference in quality of coarse aggregates.

Made with	No. 2 Gravel	No. 1 Gravel	Pounds No. 2 gravel weaker than No. 1
No. 2 cement, No. 2 sand	3141	3431	290
No. 2 cement, No. 1 sand	3382	3739	357
No. 1 cement, No. 2 sand	4202	4260	58
No. 1 cement, No. 1 sand	4438	4711	273
Average	3790	4035	245

The following table shows the difference in strength of concrete on the two jobs directly attributable to the difference in quality of cement:

TABLE 3.

Variation in strength of concrete due to difference in quality of cement.

Made with	No. 2 Cement	No. 1 Cement	No. 2 cement weaker than No. 1
No. 2 sand, No. 2 gravel	*3141	4202	1061
No. 2 sand, No. 1 gravel	3431	4260	831
No. 1 sand, No. 1 gravel	3739	**4711	972
No. 1 sand, No. 2 gravel	3382	4438	1056
Average	3423	4402	980

*This cement, sand, and gravel gave average strengths of 2675 pounds on paving project Number 2.
**This cement, sand, and gravel gave average strengths of about 5000 pounds on paving project Number 1.

Conclusion.

1. Of the difference in strength of concrete on the two projects:
Table 1 shows sand to be responsible for 290 lbs. sq. in. 18%
Table 2 shows gravel to be responsible for 241 lbs. sq. in. 15%
Table 3 shows cement to be responsible for 1060 lbs. sq. in. 67%

Total difference traceable to material 1591 lbs.

Actual difference in concretes made in laboratory with accurate control of water and uniform manipulation 1570 lbs.

Actual difference in field concretes from the two jobs about 2300 lbs.

Difference due to excess water and other variations about 700 lbs.

2. By regrading the sand to a coarser curve, some of the difference due to low strength ratio of sand might have been eliminated. (Reference in this connection is made to tests of materials for another paving project, recently reported, in which 200 to 300 pounds was added to the strength of sand by regrading to a coarser curve.)

3. Number 1 sand and gravel can be considered of as good a quality as can reasonably be expected under favorable conditions. By bringing the quality of sand and gravel on the Number 2 job up to the quality of project No. 1 material, and by most accurate control of water in the mixture, the strength might have been increased about 1230 pounds. By substituting a stronger cement 1060 pounds might have been added.

4. This series indicates it is possible to predetermine the quality of concrete to be produced with any given combination of aggregates of a known quality. It also indicates the water cement ratio and the fineness modulus are not the only considerations in the proper design of concrete.

STRAIGHTENING COUNTY-BUILT APPROACH TO SEQUOIA NATIONAL PARK—The road from Visalia to Sequoia Park originally was paved by the county. After it became a state highway, it was widened and straightened by Division VI to take care of the increasing travel into Giant Forest. (1) and (2), before and after views. The others show dangerous curves eliminated. Additional sections of pavement will be necessary before the work is completed.

THE GENERALS' HIGHWAY

(Continued from page 3.)

Recent traffic counts on this section indicate an average traffic of over 300 vehicles per sixteen-hour day.

Government Dedication.

The new government road within the park leads from the end of the state highway to Giant Forest by way of Hospital Rock and the Middle Fork of the Kaweah River, eliminating the steep and dangerous road through the North Fork of the Kaweah, previously the main entrance to the Big Trees. This highway, although incomplete, was dedicated by Stephen T. Mather, Director of National Parks, on September 5th, the ceremonies taking place at the park entrance above Three Rivers.

The work necessary on the Sequoia Park entrance is similar to problems confronting the commission in many sections of the state. Standards of a few years ago are inadequate to meet present and future traffic. Thousands of dollars must be expended for reconstruction, widening and straightening of these county-built highways before large numbers of motorists can travel them in pleasure and safety.

NOVEMBER 1 CLOSING DATE FOR CIVIL SERVICE TESTS

THE STATE Civil Service Commissioner has extended, until November 1st, the time for filing applications by those wishing to take the examinations for positions in the engineering service.

The following examinations are open to American citizens between the ages of eighteen and sixty-one, who have the education and experience required for the various grades of positions:

Junior Engineering Aid, Grade 1
- Rank A—No previous experience.
- Rank B—With experience.

Civil Engineering Aid, Grade 2.
Junior Civil Engineer, Grade 3.
Assistant Civil Engineer, Grade 4.

Promotive Examinations Scheduled.

In order to give state employes an opportunity to advance by promotive examinations will be held in the near future for positions of Associate Highway Engineer, grade 5; and Highway Engineer, grade 6, and also for the following positions:

Civil Engineering Aid, Grade 2.
Junior Civil Engineer, Grade 3.
Assistant Civil Engineer, Grade 4.

These promotional examinations have been requested by the State Highway Engineer and are open only to state employes who have civil service standing in the engineering service.

Applications should be filed immediately with the State Department of Civil Service, Room 331, Forum Building, Sacramento. The dates for the examinations will be announced in the future.

Gasoline Tax Aids Road Construction in Mexico.

Effective April 1, a tax of 3 centavos (about 1½ cents) per liter is being levied on the domestic consumption of gasoline in Mexico. The proceeds, which it is said will amount to about 4,000,000 pesos (about $2,000,000) yearly, are to be devoted to road building.

—*Engineering News-Record.*

"Dinah," said the mistress, "I hear you are married."
"Yassum, I got a good man now."
"Does he provide for you all right?"
"Yas, he's a good provider, but I'se skeered he going to be cotched at it."—*Everybody's Magazine.*

A FEDERAL AID CATECHISM

United States Bureau of Public Roads—California Highway Commission

1. WHAT IS FEDERAL AID?

Federal aid consists of appropriations made by congress to be apportioned among the several states to aid highway construction on a system previously proposed by the states and approved by the Secretary of Agriculture.

2. FROM WHAT SOURCE IS THIS MONEY DERIVED?

From taxes paid the federal government. Internal revenue taxes on automobiles, accessories, etc., it should be pointed out, greatly exceed federal aid appropriations.

3. HOW MUCH FEDERAL AID IS APPROPRIATED?

This depends upon congress. The last appropriation was $75,000,000 per year for the fiscal years 1926 and 1927.

4. HOW MUCH FEDERAL AID IS APPORTIONED TO CALIFORNIA?

Approximately $2,472,636 per year under the present appropriations.

5. HOW ARE THE FEDERAL AID APPROPRIATIONS HANDLED?

By the United States Department of Agriculture through the Bureau of Public Roads and in cooperation with the state highway departments.

6. WHAT IS THE BUREAU OF PUBLIC ROADS?

It is an organization of experienced highway engineers charged with the administration of federal aid and the location and construction of forest highways. The headquarters of the Chief of Bureau are in Washington, D. C., with a regional office at San Francisco; and twelve district offices, each in charge of a district engineer. District No. 2, with headquarters in San Francisco, administers federal aid in California, Nevada and Arizona.

7. HOW ARE THE FEDERAL AID ALLOTMENTS DETERMINED?

One-third in the ratio of the area of the state to the total area of all the states;

One-third in the ratio of the population of the state to the population of the entire country as determined by the latest available federal census;

One-third in the ratio that the mileage of rural delivery and star mail routes of the state bear to the total mileage of rural delivery and star mail routes in all the states.

8. WHAT IS THE PERCENTAGE OF FEDERAL PARTICIPATION?

The government pays 50 per cent of the cost of the project, BUT NOT TO EXCEED $15,000 PER MILE, except that in the public land states this percentage is increased in proportion to one-half the percentage of public lands, excluding national forests.

9. DOES THIS MEAN THAT THE TOTAL APPORTIONMENT OF FEDERAL AID TO THE STATE IS INCREASED?

No. The public land states do not get a cent more federal aid in proportion than the other states. They can, however, match the federal funds with smaller local appropriations.

10. WHAT IS THE PERCENTAGE OF FEDERAL PARTICIPATION IN CALIFORNIA?

In California the federal government pays 60.05 per cent, or a maximum of approximately $18,000 per mile. No matter how costly a federal aid project may be this is all the government advances toward its cost.

11. ON WHAT ROADS CAN FEDERAL AID BE OBTAINED?

Only for projects on the federal aid highway system.

12. WHAT IS THIS FEDERAL AID HIGHWAY SYSTEM?

It is a connected system of arterial highways that will provide continuous highway transportation between important centers and will give access to main highways within or connecting the states. The Federal Highway Act of November, 1921, provided for the establishment of such a system, the mileage of which was based on the mileage of all existing roads of record in the states. Each state certified to this mileage and 7 per cent of the total within the state was designated as the federal aid system.

13. WHAT IS THE LENGTH OF THE FEDERAL AID SYSTEM IN CALIFORNIA?

The total is 4,493 miles.

14. CAN THIS MILEAGE BE EXTENDED?

Only upon completion of the federal aid system as now approved.

15. DOES FEDERAL AID APPLY TO MAINTENANCE?

No. These funds so far have been appropriated for construction only.

16. WHAT TYPES OF HIGHWAYS MAY BE BUILT WITH FEDERAL AID?

There is no restriction in the selection of the type so long as it is adequate to serve traffic on the particular road under improvement. It may be either graded and drained, or of any type involving surfacing, either gravel, asphaltic or cement concrete. The type of improvement depends upon the amount of traffic, materials and funds available.

17. WHAT IS THE USUAL PROCEDURE IN HANDLING FEDERAL AID?

The route is designated by the state and approved by the Secretary of Agriculture as a part of the federal highway system. Actual location is then made by the state, subject to approval of federal engineers. Plans and estimates are next prepared by the State Highway Department, which enters into an agreement with the Secretary of Agriculture for government participation in the cost. Construction is under direct supervision of the state, subject to inspection and recommendation by the federal engineers. The federal government pays its share of the cost to the state only as the work is completed. The GOVERNMENT DOES NOT TURN OVER THE FUNDS IN ADVANCE.

18. IS THE MAINTENANCE OF FEDERAL AID PROJECTS BY THE STATES AFTER COMPLETION A REQUIREMENT OF THE LAW?

Yes. All project agreements specifically provide that the state will maintain the highway upon completion. Failure to do proper maintenance may result in the Secretary of Agriculture refusing to approve additional projects for construction until maintenance is brought up to the required standard.

19. IS THE CONDITION OF MAINTENANCE RECEIVING THE ATTENTION OF THE BUREAU OF PUBLIC ROADS?

Yes. Frequent examination is made of completed projects, and unsatisfactory conditions are brought to the attention of the State Highway Department. Repairs must be made within a reasonable time.

20. WHAT IS THE WIDTH OF SURFACED HIGHWAY REQUIRED UNDER THE LAW BEFORE THE 7 PER CENT SYSTEMS ARE CONSIDERED COMPLETE?

The final improvement must have surfacing at least 18 feet wide. Some projects are being constructed without surfacing, the agreements in such cases provide for future surfacing when needed. In California, pavements are being built 20 feet in width.

21. WHAT IS THE MAXIMUM GRADE NOW APPROVED BY THE BUREAU OF PUBLIC ROADS ON FEDERAL AID PROJECTS?

The maximum grade is 6 per cent. In extreme cases, where to adhere to this grade would cause an expenditure of money

(Continued on page 9.)

LASSEN COUNTY BRIDGES SURFACED WITH EMULSIFIED ASPHALT

By H. Carter, Resident Engineer, Bridge Department.

OWING to the remote locations and the difficulty and expense entailed in bringing in a plant and roller equipment for a hot mix, the California Highway Commission decided, as an experiment, to surface with cold asphalt seven timber deck bridges over Pit River and overflow channels. The structures are located on the Alturas lateral in Big Valley, Lassen County. The surfacing used was an emulsified asphaltic material, known as "Laykold." It was shipped in in barrels of approximately 400 pounds net weight. Sand and rock were obtained locally.

In preparing the cold asphalt for the mixer, one man with a large paddle first partly mixed the material in the barrels. It was then dumped into large mixing boxes, and worked with a hoe until thoroughly broken up. To avoid delays, two of these mixing boxes were used.

Equipment Used.

The equipment used for the surfacing consisted of a one-sack Jaeger Mixer, two tight mixing boxes (each large enough to hold two barrels of Laykold), one box to hold mixed materials, one hand tamper 22' x 4" cut to crown of bridge, two wheel barrows, a one-ton truck, and one 750-pound hand roller.

The labor required was as follows: One mixer operator, two laborers mixing Laykold, three men to wheel and shovel aggregate, two spreaders and two tampers.

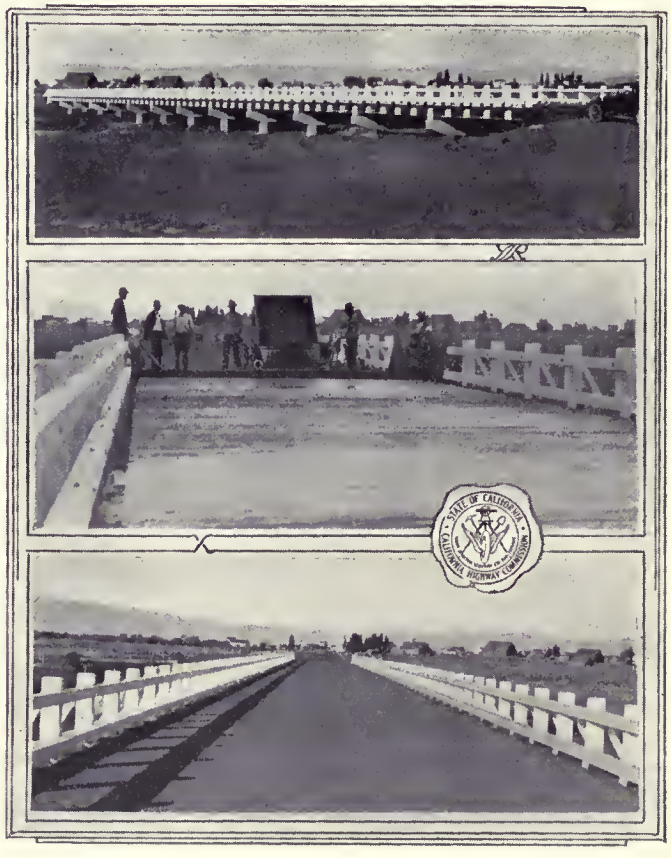
Mixing—The mixer was first charged with Laykold, and aggregate and sufficient water added to make a good mix. The batch was held in the mixer from 1½ to 2 minutes until thoroughly mixed. It was then dumped into a box, shoveled into a truck and hauled to the bridge.

Method of Placing.

Placing—Before the material was placed, the bridge was swept clean and a coat of two parts water to one of Laykold was broomed over the surface. The surfacing material was then dumped onto the bridge, and spread and tamped in the same manner as concrete. After two to four hours, it was rolled with a 750-pound hand roller. When thoroughly dry, a seal coat of one part water and one part Laykold was spread over the surface and a coat of coarse screenings drifted over it.

This was again rolled and a smooth, easy-riding surface was the result.

Owing to the short time these bridges have been in use; the suitability of this type of curfacing can not be determined, it is announced by the bridge department.



NEW TYPE OF BRIDGE FOR LATERAL ROADS—Views of recently completed structures over Pit River and its overflow channels on the Alturas lateral in Big Valley, Lassen County. These bridges have concrete piles and bents and a heavy wooden deck with an asphalt floor. The cost was considerably less than for an all-concrete structure but amply strong for the traffic of a lateral road. Center view shows method of placing cold asphalt surfacing.

EDITOR MAKES CORRECTION

THE ACTION of L. W. Wigmore of the Orland *Register,* in correcting misstatements appearing in his publication alleging lack of care of highway trees in the vicinity of Orland by the California Highway Commission, is appreciated by the department and is indicative of the desire of newspaper editors generally to give the people the truth.

Persons, who were not properly informed, asserted to the *Register* that trees planted along the highway in northern Glenn County were dying from lack of water and proper care. The facts were that the trees had been watered at regular intervals during the summer by F. R. Garrison, Division III maintenance foreman in charge, and had been given care equal to that of trees anywhere on the system. A few of the weaker plantings had died, due to soil conditions and borers to which European Sycamores are particularly susceptible during the first years of growth.

When these facts were brought to the attention of Mr. Wigmore, he readily published a signed correction giving the facts as stated.

Replacements will be made next winter under the direction of W. E. Glendenning, the commission's tree expert, who has inspected regularly the Glenn County plantings.

Motor Car Version.

Lives of tourists should remind us
As their trails we often see,
Not to leave tin cans behind us,
Paper, food and such debris.

NEED WIDER BRIDGES

(From the Whittier News.)

PROFITING by the experience of the past, the State Highway Commission is causing to be erected over the San Gabriel River the widest bridge in the entire state system. This new bridge is to be forty feet wide, with additional walks on both sides for pedestrians. Narrow bridges act as the neck of a bottle, and impede traffic. Bridges constructed two years ago on some of the major highways have already proven too narrow.

The various committees and road promoters should profit by the experience of the State Highway Commission and where bridges are needed for the new boulevards, insist on the wide bridges, something that will not impede traffic.

A FEDERAL AID CATECHISM

(Continued from page 7.)

beyond reason, short sections of steeper grade may be employed.

22. DOES THE BUREAU MAINTAIN A LABORATORY FOR TESTING MATERIALS ENTERING INTO CONSTRUCTION OF HIGHWAYS AND BRIDGES?

Yes. A testing laboratory is located in Washington where materials used in highway construction may be tested to establish the fact that they comply with specifications. This service is free to the states desiring to have materials tested. In addition, most of the states have testing laboratories. California has a very complete testing laboratory.

23. ARE OTHER FEDERAL FUNDS AVAILABLE FOR ROAD CONSTRUCTION?

Yes. Appropriations by congress for roads and trails within the national forests, Indian reservations, national parks, etc.

24. ARE THESE FUNDS EXPENDED FOR CONSTRUCTION ON THE FEDERAL HIGHWAY SYSTEM?

Not necessarily. The Federal Highway Act of 1921 also provided for a system of forest highways. The forest highway system is selected, subject to approval by the Secretary of Agriculture, by representatives of the United States Bureau of Public Roads, state highway departments and forest service. It involves the improvement of roads within or adjacent to the national forests. The forest highway system agreed upon for California includes 2,045.5 miles, 1,321.5 miles of which are also state highways, and 724 miles county highways.

25. HOW ARE FOREST HIGHWAY FUNDS HANDLED?

By direct expenditures through the Bureau of Public Roads. On forest projects the federal government pays up to 100 per cent of the cost of construction, or in a reduced percentage, depending upon the amount of cooperation received from the state, county, or local subdivision.

26. WHO HAS CHARGE OF SUCH FOREST HIGHWAY CONSTRUCTION?

The Bureau of Public Roads makes location surveys, design and estimates and directs construction of forest highways and major forest development roads where the cost amounts to more than $5,000 per mile. The forest service has charge of the survey and construction when the cost is $5,000 or less per mile.

27. HOW MUCH MONEY IS PROVIDED FOR NATIONAL FOREST ROADS?

This depends upon congress. The appropriation for the fiscal years 1926 and 1927 is $7,500,000 for each year. Of the yearly appropriation, $4,500,000 is directed to be expended for construction of major highways and development roads within the national forests, and $3,000,000 for minor roads and trails.

These funds, of course, are divided among all the national forests of the country. Under these appropriations, California is receiving approximately $500,000 per year for the forest highways.

PROTECTING THE HIGHWAYS

PROPER protection and adequate maintenance of existing state highways is as necessary as the construction of new ones. The added importance of maintenance is being continually emphasized by engineers of the California Highway Commission, as highways constructed, in many instances, more than a decade ago, are called upon to bear a constantly increasing traffic.

In 1912, when the first state highway contracts were awarded, there were 75,000 registered motor vehicles of all classes in California. Trucks, compared with those of today, were light in weight and capacity and comparatively few in number. Heavy duty trucks today outnumber the total registration of ten years or twelve years ago.

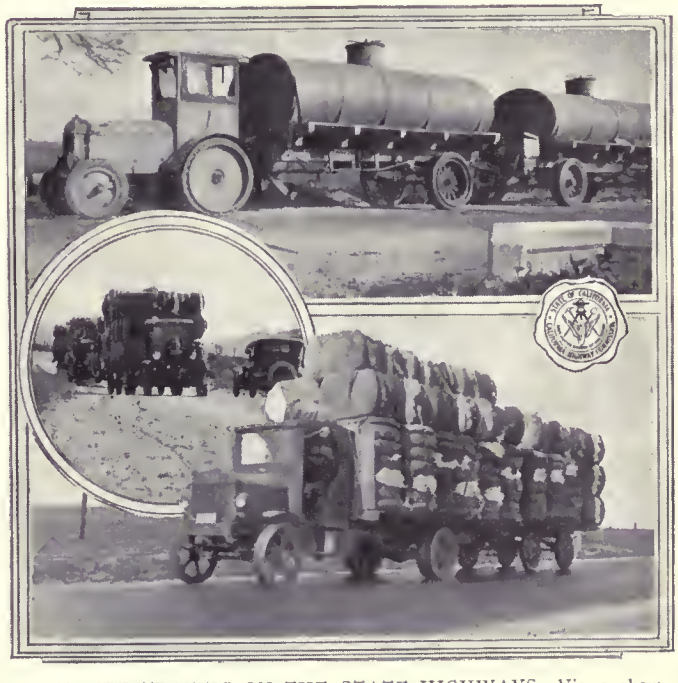
The public is coming to an understanding of the necessity for reasonable truck regulation and weight limits. The economic wealth of the state can not supply funds sufficient to build highways that will stand up under unregulated truck traffic.

Cotton and rice are two crops moved extensively over state highways. Both have been developed since the building of state highways began. Gasoline is now being moved over the state highways in large quantities in tank trucks. These are only some of the problems which the highway commission must meet in its program for maintenance of constructed highways and the designing of new pavements.

Editorial Comment.

Discussing this phase of the highway problem, and the necessity for adequate maintenance, the *Los Angeles Express,* in a recent editorial, said:

> The importance of saving and preserving in good condition the splendid highways of California becomes increasingly important as greater numbers come to enjoy them and traffic flows in volume. In consequence a new watchfulness over the roads, to see they are not misused, is being established, by the state highway commission and the motor vehicle department acting together.
>
> Heavy trucking is responsible for most injury to the paved roads. Soon after freight hauling by motor truck became an established practice, and the effect on the roads was seen, it was found necessary to limit by law the weight of load which might be carried. But not all observe the law. Therefore patrols are being established over the state, the men equipped with loadmeters, with which they are able to ascertain in a few minutes the exact weight of any truck they believe may be overloaded.
>
> Of course, this entails added expense on the highway department, and should not be necessary. Those whose business depends so much for success on the condition of the roads ought to be more anxious than anybody to protect the roads from injury, either by themselves or others. Many of them do feel that way. And those that refuse to cooperate voluntarily will feel the weight of compulsion. The highway commission and motor vehicle department are determined to put a stop to use of the roads by overloaded trucks. They deserve praise for the work they are doing.



TRUCK TRAFFIC ON THE STATE HIGHWAYS—Views showing the kind of traffic which must be taken care of by California state highways. ABOVE, truck tank cars transporting products of the Coalinga oil fields over the state highway to Fresno; CENTER, trucks loaded with cotton on the way from Imperial Valley to Los Angeles; BELOW, cotton truck photographed on the state highway in Kern County.

By a majority of eight to one, Marin County voters have approved a bond issue of $1,250,000 for the improvement of ninety-six miles of county highways. It is expected that the roads to be improved, together with state highways within the county, will carry 90 per cent of the county's traffic.

GOODBYE WATER BREAK—ANCIENT PRACTICE DISCONTINUED

By F. W. Haselwood, Acting Division Engineer.

TRAVELERS over the Sierra this fall by way of Placerville and Echo Summit or by Auburn and the Donner grade are missing a thrill familiar to all who heretofore have traveled these roads in the late fall or early spring. *The water breaks are missing.* Some 270 of these high diagonal ridges, which, about the first of October, have been built across the roadway at frequent intervals, have been replaced by slat-top wooden culverts built flush with the road surface, as shown in the accompanying illustration.

A water break, as customarily built in the high Sierra, was a formidable obstacle. It was constructed by placing a small log or row of rocks diagonally across the road and covering them with a mound of earth about two feet high and four feet wide. When compacted, this formed a ridge from twelve to fifteen inches high.

Contrary to popular opinion, these water breaks were not installed for the deliberate purpose of wrecking cars, even though the strategic location usually was just around a blind curve. They were constructed solely as a drainage device.

On the steep, unsurfaced mountain grades that are closed during the winter by a heavy blanket of snow, a water break served a peculiar drainage requirement that was not met by the usual type of culvert. In the spring when the snow begins to melt, not from the top but from its contact with the ground, the water starts down the grade following depressions made by the last vehicle in the fall, and quickly accumulates in volume and increases in velocity. Unless diverted at intervals, the flowing water will carry away all of the fine materials of the road surface. The water break intercepted this flow, as well as that from the side ditch, and diverted it away from the road.

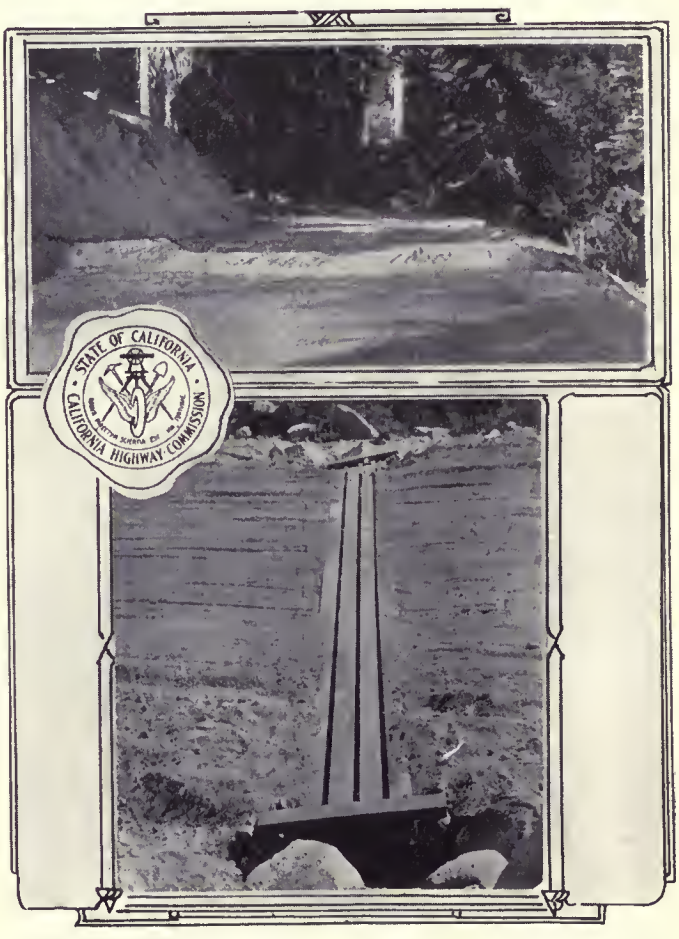
Water breaks, therefore, in their appropriate season, formed an integral part of the mountain roads; so much so that they have been considered a chronic affliction. They have been constructed each fall as maintenance crews worked down the mountain ahead of the storms, and have been removed each spring as soon as the roads were cleared of snow. This work was not only an annual expense of considerable magnitude but occupied the time of the crews when they were needed on other work.

Experiment Proves Success.

Last year two experimental culverts were built by Division III near Emigrant Gap. They proved so successful that some 270 have been installed this fall.

There is nothing new about these culverts except their extensive use. They are ordinary wooden box culverts with tops built of three or four timbers four inches by four inches and spaced one inch apart. The top is set flush with and parallel to the grade of the road. Roadside drainage is carried through and surface drainage intercepted by the culvert. The top is removable to permit cleaning the culvert of fine material with which it may become filled during the course of summer maintenance. The cost of the new culverts is but little more than the cost of constructing and removing a water break and their annual maintenance cost should be insignificant.

Travelers on the mountain roads late this season have commended the innovation which permits usual speed and hauling of normal loads.



GOODBYE TO THE WATER BREAK—*Above,* the ancient but unhonored water break, curse of travelers on mountain roads since early days; *below,* type of open drainage culvert adopted by Division III as a substitute for the water break. (Photos by Division III.)

FEDERAL AID ENDORSED

AT ITS RECENT annual convention in St. Louis, the National Sand and Gravel Association, after discussing the subject of federal aid, adopted a resolution which reads, in part, as follows:

> "Federal aid law and federal highway appropriations have been the stimulating force behind the country's effort to provide adequate and needed highways, both as a measure of national defense and facility of commercial transportation."

Officials of the association announce that this resolution places their organization squarely on record behind the federal aid principle. Congress was petitioned to continue the present policy. In announcing the adoption of the resolution, the association representative said:

> "There are signs today that certain possibly uninformed persons are endeavoring to eliminate the policy of federal aid, but their efforts will come to naught when the facts are brought forth for examination."

JUDGED BY HIS ROADS

(From the Placerville Mountain Democrat.)

In California a county supervisor is judged by the roads he builds. It is a peculiar test of efficiency but is the one in general use. That being true it now behooves all supervisors to become as intimate as possible with the engineering department of the State Highway Commission.

FAMOUS LOS ANGELES ENGINEER COMMENDS MAINTENANCE METHODS

MAINTENANCE of desert highways, particularly the work being done by Division VIII on the Mecca-Blythe Highway, was favorably commented upon recently, following a trip to Blythe, by William Mulholland, chief engineer and manager of the Bureau of Water Supply of the City of Los Angeles. In a letter to the Bulletin, Mr. Mulholland, who has been familiar with desert conditions for many years, expresses the opinion that proper and intelligent maintenance will provide good, serviceable roads in many sections of the desert.

Discussing the work that is being done by the commission on the route between Shaver's Summit and Blythe, the famous Los Angeles Engineer says:

> "A year or so ago the best time that could be made over the ninety miles was five hours. I have recently covered this same distance in the same make of machine in three and three-quarter hours without effort and with complete comfort.
>
> "This accomplishment is due to the recognition of the natural character of the road bed coupled with intelligent treatment of same and I am glad to notice the same policy is being pursued with other good roads in this state."

IRRIGATION WATERS MUST NOT STAND ON HIGHWAY

(From the Glendora Gleaner.)

IRRIGATION waters allowed to stand on the highway caused a suit against two farmers in the San Joaquin Valley. The case was heard in Stockton and the farmers were given heavy sentences. The State Highway Commission were the prosecutors. They claimed there was no excuse as the farmers were warned before the water was to be turned on and again when the ditch broke. They made no effort to get the water off and the roadbed was damaged. The case is said to be the first one of its kind in the state, and that the state won is encouraging. Roads cost too much money to be destroyed by carelessness.

CHEERFUL NEWS

(From the Santa Cruz Sentinel.)

IT IS cheerful news that comes from the State Highway Commission that $10,000 has been apportioned from the motor vehicle fund for continued improvement on the road between Boulder Creek and the Big Basin.

The engineer's specifications call for making a 24-foot roadway, taking out curves and cutting down several grades. It is estimated by those who have kept tab on park travel that fully 65 per cent of the people who visit the park go in via the Boulder road owing to the steep climb from the Saratoga side.

With the state park yearly becoming more popular, especially with southern California people, it is important that the road be put in the best possible condition and the $10,000 will go a long way toward completing the work which got a good start this summer.

THE CONSTITUTION OF THE UNITED STATES OF AMERICA.

Article I, Section 8—The Congress Shall Have Power to Establish POSTOFFICES and POST ROADS.

AN ACT OF CONGRESS, Chapter 9—An Act making all public roads and highways Post Routes: Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That all public roads and highways, while kept up and maintained as such, are hereby declared to be Post Routes. Approved March 1, 1884, U. S. Statutes, 1882-1885.

"Willie," asked the teacher, "what was it Sir Walter Raleigh said when he placed his cloak on the muddy road for the beautiful queen to walk over?"

Willie, the ultra-modern, gazed about the classroom in dismay, and then, taking a long chance, replied:

"Step on it, kid!"

HERE'S A REAL SUBSIDY

THE Land Grant of 1864 to aid the construction of the Northern Pacific Railway conveyed approximately 40,000,000 acres of government land to the railway company. From this land great sales aggregating $136,000,000 have been made by the Northern Pacific Company up to 1917. The Nation's total gift to the railroads to aid in their development was 158,293,736 acres of land from the public domain. At ten dollars an acre this vast empire had a potential value of over one and one-half billion dollars.

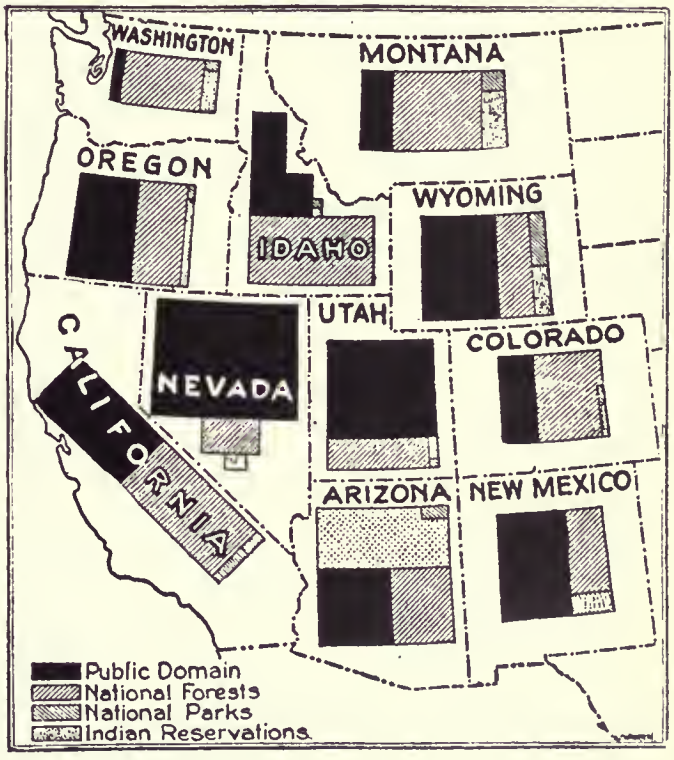
This was a means of encouragement of transportation development, and in view of these conditions the amounts being appropriated by congress in the form of federal aid in highway building seem little enough to encourage the most modern form of transportation which is of vital interest to every citizen and every community.—*Nevada Highway News.*

UNAPPROPRIATED PUBLIC LANDS

The interior department announces vacant and unappropriated public lands in the United States exclusive of national forests and other reserved areas total 184,716,846 acres, of which 129,606,234 have been surveyed.

The largest areas are in Nevada, with 52,456,837 acres, and the smallest areas are in Louisiana with 10,701.

Arizona has 13,578,760; California, 18,946,582; Colorado, 7,464,208; Idaho, 9,887,139; Montana, 6,081,750; Nebraska, 29,797; New Mexico, 16,222,744; North Dakota, 131,455; Oregon, 13,251,000; South Dakota, 264,861; Utah, 28,583,778; Washington, 823,716, and Wyoming, 16,447,935.



GOVERNMENT HOLDINGS IN PUBLIC LAND STATES—More than half the land in these eleven states is held by the federal government. The 42,000,000 acres of government mineral lands (containing coal, oil, potash and minerals) are not included in the map, as they are not confined to the eleven public land states. The West believes the federal government should assist in building transcontinental highways across these great areas of untaxable public lands.

Building of interstate highways brings with it a distinct social benefit of which the United States are greatly in need. This is a powerful reason for federal aid.

WHAT THE DIVISIONS ARE DOING

DIVISION II.

HEADQUARTERS, REDDING.

H. S. COMLY, DIVISION ENGINEER.

Counties of Siskiyou, Modoc, Trinity, Shasta, Lassen, Tehama, and northern Plumas.

GRADING on the reconstruction contract of the Nevada Contracting Company, covering the section between Half Way Creek and Dog Creek, has progressed to a point where the highway has been thrown open to traffic for twenty-four hours daily.

Grading of a new section of state highway between Constantia and Purdy, in eastern Lassen and Plumas counties, has been completed. Lassen County cooperated with the state in financing the project.

Bids have been received for grading a four-mile section of the Alturas lateral through Big Valley, Lassen County. When completed, this work will shorten the distance between Redding and Alturas two miles. The new grade also will make usable seven new bridges across Pit River and its overflow channels, eliminating twenty-three county-built woden structures.

DIVISION III.

HEADQUARTERS, SACRAMENTO.

F. W. HASELWOOD, ACTING DIVISION ENGINEER.

Counties of Butte, Colusa, El Dorado, Glenn, Nevada, Placer, southern Plumas, Sierra, Sutter, Yuba, and northern Sacramento and Yolo.

THE IREY and Holden contract for grading from Boca to Floriston, in the Truckee River Canyon, has been extended to include 0.4 of a mile in the vicinity of Hinton crossing. The work will be done during the winter. This section was left out of the original contract because it could not be undertaken prior to the construction of the bridge at Hinton, now nearing completion.

Twelve miles of the Tahoe-Ukiah highway from Williams westerly to Venado are expected to be in good condition throughout the winter as a result of grading and surfacing work recently completed.

Four miles of grading has been completed by Irey and Holdon on their contract for the grading of 5.8 miles east of Camino on the Placerville route to Lake Tahoe, and one mile of surfacing has been placed. The work is progressing satisfactorily.

The two subways between the American River bridge and the Globe Iron Works, at North Sacramento, are nearing completion and paving of the ground level highway will start soon. The Kaiser Paving Company has sublet the paving to Lord and Bishop, builders of the underpasses.

Tahoe Highway Improved.

A 400-foot cut has been completed at the top of the Emerald Bay grade, Lake Tahoe, greatly improving the alignment of the highway at this point. Extensive rubble masonry walls, also a part of this project, have been completed. The grading is being done by state forces.

In addition to placing surfacing on the recently graded section of the highway between Magra and Gold Run, Giddings and Whyte, contractors, have been authorized to do surfacing work between Forebay and Emigrant Gap and between Donner Lake and Truckee. State forces are placing disintegrated granite on a two-mile section above Placerville, improving a section that is slippery when wet.

The construction of a 30′ by 100′ storage building has started on the recently acquired maintenance station site at Truckee. It will be completed in time for the storage of equipment during the coming winter.

DIVISION VI.

HEADQUARTERS, FRESNO.

J. B. WOODSON, DIVISION ENGINEER.

Counties of Fresno, Madera, Merced, Mariposa, Kings, Tulare, and Kern, north of the Tehachapi.

TWO reconstruction projects were completed in Division VI during October as follows:

Six miles of flush concrete shoulders and rock borders placed on the trunk highway north of Fresno by Stewart and Bland; and the placing of ten miles of rock shoulders on the Pacheco Pass lateral, east of Los Banos, by the Kaiser Paving Company.

Three miles of Willite pavement has been authorized, as an experiment, in connection with the widening to twenty feet of eight miles of the trunk highway north of Bakersfield. The concrete base is being widened and thickened with asphalt concrete.

DIVISION VII.

HEADQUARTERS, LOS ANGELES.

S. V. CORTELYOU, DIVISION ENGINEER.

Counties of Los Angeles, Ventura, Orange, San Diego, and eastern Kern, south of Mojave.

THE construction of the underpass under the tracks of the Union Pacific Railroad east of Montebello, on the Whittier Boulevard, Los Angeles County, is progressing at a rapid rate and this dangerous crossing soon will be a thing of the past. The state, Los Angeles County, and the railroad company have joined in financing the project.

Placing of pavement in connection with the widening of the boulevard in the vicinity of the under pass is going ahead satisfactorily.

The extension of the Whittier Boulevard reconstruction for 1.9 miles easterly from Philadelphia street is now well under way.

Reconstruction Contract Completed.

Placing of concdete on the 5.6 mile contract for "second story" work between San Juan Creek and Galivan, Orange County, has been completed by Jahn and Bressi. The same firm has the contract for the reconstruction of the coast highway north of Oceanside. Grading and culvert work on this latter section are well under way.

On the Coast Boulevard, north of Santa Monica, grading is now in progress on the long fill across Malibu Creek flat. Culvert work, a part of the state contract, is about completed. Los Angeles County has agreed to construct the bridges on this section, and is expected to begin work soon.

An important line change between Laguna Summit and Pine Valley on the San Diego-El Centro highway, in San Diego County, has been completed by state forces. Improvement of the alignment is now progressing easterly from Laguna Summit toward Cottonwood Creek. The crew has surfaced four miles of roadway in the same vicinity, using disintegrated granite.

Dewey and Rawson soon will start work on their contract for placing flush concrete shoulders on the foothill boulevard between San Fernando and La Canada.

DIVISION VIII.

HEADQUARTERS, SAN BERNARDINO.

E. Q. SULLIVAN, ACTING DIVISION ENGINEER.

Counties of San Bernardino, Riverside, and Imperial.

DIVISION VIII recently completed drilling a well to a depth of 153 feet in Open Valley, in the Imperial County sand hills, which recorded a flow of 500 gallons per minute for six days of pumping. It is hoped this well will provide water for mixing

concrete for the proposed pavement to be placed on the Sand Hill section. It caused a sensation because of the unusual flow.

Cloud Burst Tests New Grade.

The new highway recently completed east of the Sand Hills, Imperial County, was given a thorough test recently when a heavy cloud burst occurred in that vicinity. The grade was flooded but little damage resulted. Regular maintenance crews removed what sand was washed into the road and reshaped the grade, which is now compacted better than ever. There was no interruption of traffic.

Excellent progress is being made on the placing of a "second story" pavement between San Bernardino and Redlands, where a county pavement is being rebuilt to a width of twenty feet by the state.

Grading between Victorville and Hicks, on the National Old Trails Highway, also is progressing at a rapid rate. The work is about finished between Victorville and Oro Grande. A rock crushing plant has been established at Oro Grande and surfacing operations are being carried on from this point.

Work Resumed in Imperial.

Moderation of the hot summer weather has made possible increased activity on the three grading contracts under way in the Imperial Valley between Brawley, El Centro, Holtville and High Line canal. Large forces of men are now at work.

One of the most scenic sections of state highway in Division VIII will be the new grade along Big Bear Lake, a contract for grading having recently been awarded to the Ross Construction Company.

DIVISION IX.

HEADQUARTERS, BISHOP.

F. G. SOMNER, DIVISION ENGINEER.

Counties of Inyo, Mono, and eastern Kern County, north of Mojave.

RESTORATION of roads damaged by frequent cloud bursts during the summer months, between Mojave and Olancha, has been completed.

Preparations are now being made for grading, by contract, Ricardo to crossing of Southern Pacific Railroad near Little Lake, a distance of 36.7 miles, to a width of 30 feet.

Surfacing of eight miles with crushed volcanic cinders between Deadman and Rush Creek in Mono County, is nearly completed. George Clarke is the contractor.

Securing of rights of way is now in progress for the proposed construction from Mojave to the Kern-San Bernardino County line, a distance of 31½ miles.

Miss Margaret Peel has succeeded Miss Musa Patterson as stenographer at the Bishop office. Miss Patterson has entered the University of Texas.

C. E. O'Connell, formerly clerk in the headquarters office, has succeeded M. L. Wilson as Division Clerk at Bishop. The latter has transferred to headquarters.

State Highway Engineer R. M. Morton and Commissioner N. T. Edwards recently made an inspection trip over Division IX, crossing the high Sierra at the Somora Pass.

DIVISION X.

HEADQUARTERS, SACRAMENTO.

J. C. McLEOD, DIVISION ENGINEER.

Counties of Amador, Calaveras, Alpine, Tuolumne, Stanislaus, San Joaquin, Solano, and southern Sacramento and Yolo counties.

CONTRACTOR J. F. Knapp has completed the placing of concrete between the Stanislaus River and Turner Station, in San Joaquin County, and opening of the new pavement to traffic should take place not later than November 1st. The commission has agreed to pave a twenty-foot strip through the city of Manteca, in connection with this project.

Surfacing with crushed rock of the recently graded section of the Alpine Highway, east of Jackson, to a width of eighteen feet has been completed and Contractor R. N. Murdoch has moved his shovel to a section of the Mother Lode Highway, between Amador City and Central House. The state is doing the grading and Amador County the surfacing.

An assessment district is being formed among local property owners on the Stockton Boulevard, at the southern entrance to Sacramento, to pave the street to a width of fifty-three feet. The state is now engaged in paving two twelve-foot strips on either side of the nine-foot strip to be paved by the Central California Traction Company, which is moving its tracks to the center of the street.

Work by Maintenance Forces.

State forces, under specific allotment, are widening the Red Lake grade between Carson Pass and Hope Valley, on the Alpine Highway.

Similar work is under way on the Big Oak Flat road into Yosemite, where widening is being done between Bucks Meadow and South Fork.

A mile of rough county-built oil macadam east of Clements, on the San Andreas lateral, San Joaquin County, is being rebuilt.

BRIDGE DEPARTMENT NEWS

HARLAN D. MILLER, Bridge Engineer.

John C. Wilson has been assigned to the Willow Brook Bridge in Sonoma County, as resident engineer.

Nate Lovelace, contractor, has completed the construction of a 160-foot reinforced concrete girder bridge across Salt Creek, in Shasta County. This structure is a part of the reconstruction program on the Pacific Highway.

M. L. Hydle has returned to work in the drafting office and H. M. Sturges has succeeded him as assistant resident engineer on the Truckee River bridges.

M. J. Dwyer has been added to the department's designing force.

With the exception of the paving and the installation of sumps, construction of the North Sacramento underpasses has been completed.

H. Carter has been appointed resident engineer on the San Mateo Creek bridge in San Diego County, succeeding O. P. Dodds, resigned.

Construction of a reinforced concrete bridge across Big Sycamore Creek, in Ventura County, is nearing completion. The work is being done by the county. J. M. Lackey represents the state as resident engineer.

The Polaris Crossing across the Truckee River and the Southern Pacific railroad near Polaris, in the Truckee River Canyon, is the first of five handsome structures in the canyon to be completed.

A. B. Willett is now resident engineer on the reinforced concrete girder bridge on concrete pile bents across the Coachella storm-water drain near Indio, Riverside County.

All in a Lifetime.

"Stop, look, listen!"

The reflective man stopped to read the railway warning.

"Those three words illustrate the whole scheme of life," said he.

"How?"

"You see a pretty girl; you stop; you look; after you marry her you listen."

FLOORING A BRIDGE—View showing methods used in placing a new floor of redwood blocks on a Redwood highway bridge. Traffic was kept moving by completing half the asphalt surfacing at a time. Note the raised row of blocks in the center, to act as a traffic guide. (Bridge Department Photo.)

STATE HIGHWAY FUND CONTRACTS (Bond Funds, Including Federal Aid)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE SEPT. 3,1925.						
456	III	Colusa	15	E	Mountain House to Williams	7.36	Grade and Gravel Surface	Giddings and Whyte	$80,947 67	Oct. 6, 1924	------
					AWARDED SINCE SEPTEMBER 3, 1925.						
482	VII	San Diego-Imperial	12	H-A	Mountain Springs Grade	1.90	Grading	A. R. McGrath	$74,250 00	Sept. 21, 1925	125
483	VII	Orange	60	C	Laguna Beach to San Juan Creek	7.42	Grade and Gravel Surface	Chas. G. Willis and Son	198,516 60	Sept. 21, 1925	250
484	II	Lassen	28	A	Bieber to 4 miles West	3.80	Grade and Gravel Surface	D. McDonald	46,475 89	Sept. 21, 1925	325
					Sub-total	13.12			$319,242 49		
					PENDING AWARD. None.						
					Total State Highway Fund Contracts Awarded and Pending Award	13.12			$319,242 49		

NOTE—Primary construction covered by the above contracts does not include funds obligated on cooperative forest highway projects, prison road camp activities, or day labor jobs not being done under contract.

STATE HIGHWAY MAINTENANCE FUND CONTRACTS (Including Gasoline Tax Fund)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE SEPT. 3, 1925.						
M-60	X	Amador	34	C	Jackson to 3 miles east	2.62	Grade and Gravel Surface	R. N. Murdoch	$27,228 11	Jan. 14, 1925	------
M-62	III-X	Yolo	6-7	A	Southerly Boundary to Woodland and Davis	12.79	Concrete Shoulders	Kaiser Paving Co.	167,304 02	Mar. 12, 1925	------
M-69	VI	Fresno	4	C	2 miles north of Fresno to Herndon	5.94	Concrete Shoulders	Stewart and Bland	54,429 97	April 15, 1925	------
M-87	V	Monterey	2	G	San Ardo to San Lucas	11.00	Rock Borders	Fred Neighbert	34,880 63	June 17, 1925	------
					AWARDED SINCE SEPTEMBER 3, 1925.						
M-99	VIII	San Bernardino	43	D	Big Bear Dam to Fawnskin	3.27	Grading	M. S. Ross	$32,609 54	Sept. 21, 1925	60
M-100	X	Sacramento	4	B	Sacramento to one-half mile south	.47	A.C. Pavement	A. Teichert and Son	22,680 56	Sept. 21, 1925	50
M-101	VII	Los Angeles	9	A	San Fernando to La Canada	15.10	P.C. Concrete Widening	Dewey and Rawson	174,990 38	Sept. 21, 1925	250
M-102	IV	Sonoma	1	C	Across Willow Brook	------	R.C. Girder Bridge	Lozier and Carr	17,997 50	Oct. 9, 1925	100
					Sub-total	18.34			$248,277 98		
					PENDING AWARD.						
------	V	Santa Barbara	2	J	Summerland to Montecito	1.40	Grade and Rock Surface		$74,796 50	----------	100
					Total State Highway Maintenance Fund Contracts Awarded and Pending Award	20.24			$323,074 48		

NOTE—The above obligations charged against the State Highway Maintenance Funds do not include funds from these sources obligated for general maintenance and for specific betterments being done under day labor authorization.

HIGHWAY NEWS NOTES

Division III Changes.

L. A. VANCE, formerly maintenance foreman at Gridley, Butte County, has been transferred to similar work in Sacramento County. He has been succeeded at Gridley by Chester Butz, formerly assistant to Foreman Dan Breuning at Nevada City.

F. R. Bakers is resident engineer on the North Sacramento paving project.

H. B. La Forge, assistant resident engineer, has been transferred to Division V for duty at Santa Barbara.

Division VII.

It is with deepest regret that the Bulletin leanrs of the death of Earl Sheridan, two-year old son of E. T. Scott, Maintenance Superintendent, Division VII. The little fellow passed away at the Los Angeles Children's Hospital after a short illness.

C. V. Kiefer, assistant resident engineer, Division VII, is recovering from an appendicitis operation.

Homer B. Lindley and Winthrop Aldrich have been assigned to paving and grading projects along the Orange County coast, as assistant resident engineers.

Herbert Cooper, Division VIII announces, has been assigned to the Big Bear Lake grading project as resident engineer.

Division X.

The modesty of Grant P. Merrill, popular maintenance foreman located at Woodfords, Division X, kept him from announcing the arrival several months ago of his third son, who is now nearly seven months old.

Miss Hazel McBeth, formerly with headquarters, is now with the clerical department of Division X.

C. M. Butz has been transferred to the Bridge Department as resident engineer on the West Sacramento subway.

Mrs. Daisy M. Nugent, typist, has left Division X and is now residing at Folsom.

Headquarters.

Mrs. May J. Caruthers, mother of W. S. Caruthers, for many years associated with the engineering forces of the commission, passed away in Sacramento, October 11th. Mrs. Caruthers was a native of Jackson, Tenn., aged 90 years.

H. D. Stover of the bridge department is a member of a committee which has in charge a tennis tournament for state employees residing in Sacramento.

EDWARDS MAKES GOOD

(From Laguna Life.)

NELSON T. EDWARDS of Orange, State Highway Commissioner, informed the people of Laguna Beach through *The Life* last fall that the contract for the grading for the Coast boulevard from Laguna Beach to Serra would be let some time during 1925. Bids have been called for September 7 and it is likely that the contract will be let within two weeks of that time.

At the time he gave out the interview, Mr. Edwards said that he had talked with the other commissioners and they were of one mind in the matter of finishing the link of highway between Laguna Beach and San Juan Creek. The only delay would be a matter of funds. This year federal aid money was divided equally between northern and southern California and the road from Newport Beach to Serra was allotted its share for grading and surfacing. Mr. Edwards has made good his promise.

Why He Went Faster.

A foreign young man purchased an automobile and was seen driving down the street about 60 miles an hour. A policeman yelled at him to stop, but instead of slowing up he increased his speed. When the officer finally caught up with him he roared:

"Why didn't you stop? Didn't you hear me holler back there?"

"Oh, vas dat you dat yelled? I thought it vas somebody I run over."

"THE ENGINEERING IS PERFECT"

(From the "People's Safety Valve," San Francisco Chronicle, September 19, 1925.)

Editor, The Chronicle:

SIR—Having just returned from a motor trip over the Redwood Highway to Crescent City, may I have a few comments on the road, the road signs and the people?

The scenic beauty of the road is wonderful and awe-inspiring, the engineering is *perfect* and the people one meets are kindly and courteous. But why the damage-to-the-mind road signs? Every small, easy curve is heralded as "Danger," "Sound Horn," "Slow Down to 15 Miles an Hour," and other such advice. To the timid occupant of a back seat these signs strike terror to the heart, although one's fears are soon allayed by finding the curves (with few exceptions) wide and easy to traverse.

However, these signs are like the little boy crying, "Wolf, wolf"; sometimes a driver, knowing the sign language by past experience, does not slow down and grief comes.

A highway engineer from another state, instrumental in making a wonderful scenic road, would not allow the word "danger" on a single road sign. He said that if a curve were dangerous it should not be so marked.

However, it is a wonderful drive, which will long remain in our memories.

MRS. ASTOR.

Santa Maria, September 16, 1925.

WORK APPRECIATED

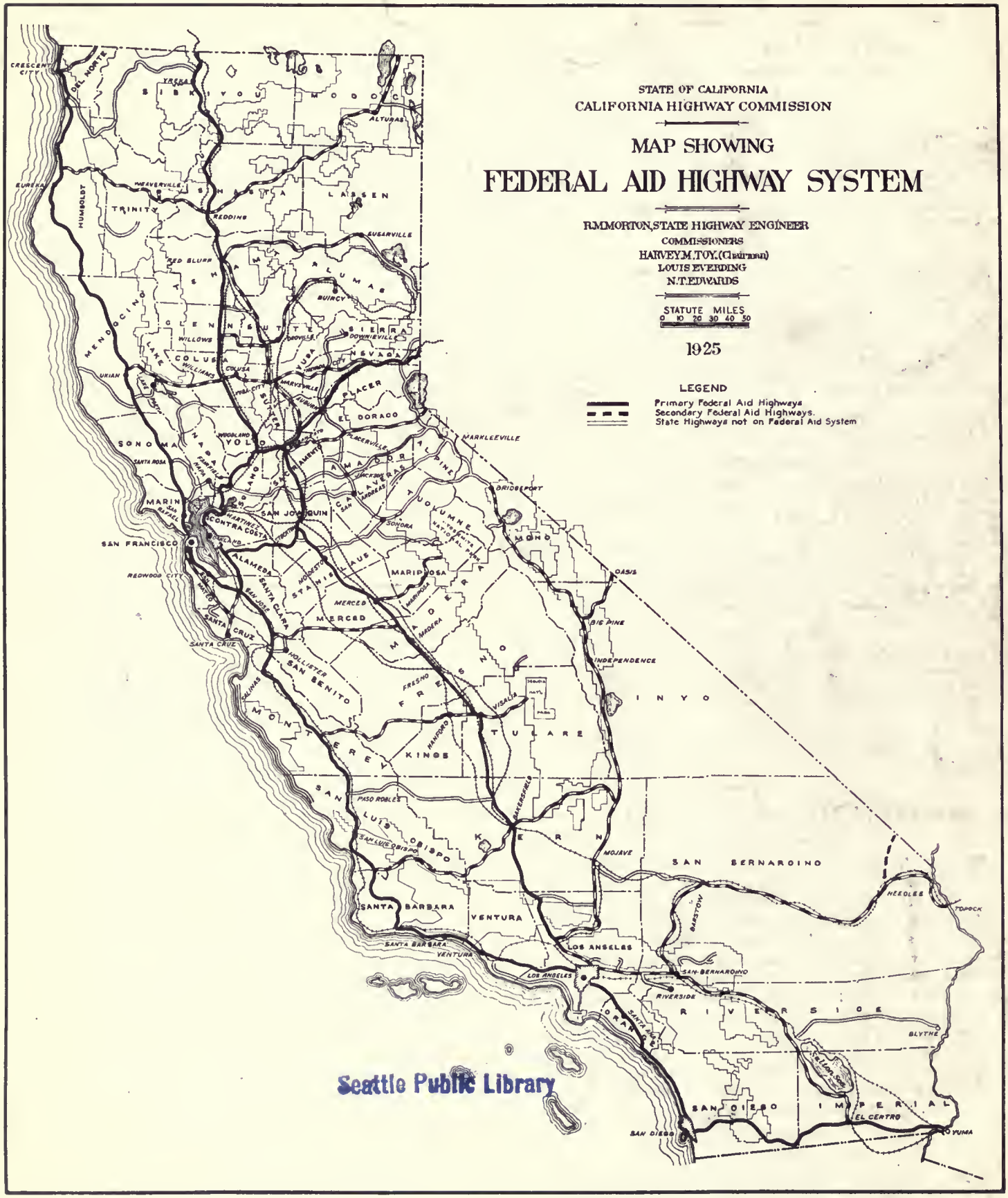
(From the Placerville Mountain Democrat.)

The people of El Dorado County fully appreciate the additional funds recently allotted by the Highway Commission for reconstruction and maintenance work on the highway between Placerville and Fresh Pond and along the shores of Lake Tahoe near Emerald Bay. We are especially thankful to Mr. Montfort, the engineer in charge, who is thoroughly sold on this highway and is trying to make it what it should be. He realizes that in a few years all roads combined will be used to capacity to accommodate the travel to and from Lake Tahoe.

POET'S VIEW OF FEDERAL AID

(Oscar H. Fernbach in the San Francisco Examiner.)

"Oh, the East, in divers sly ways,
In occulted schemes, and by-ways,
Now is plotting 'gainst our highways
In the West:
Poor their future vision waxes,
As they grind their verbal axes
'Gainst our use of federal taxes
To protest.
Their own loss they are abetting
When against the help they're fretting
That from Uncle Sam we're getting
For our roads:
Their own interests gainsaying
When the highway plans they're flaying—
All they think is, they are paying—
And it goads.
Let us stop such foolish chatter
And the foes of progress scatter!
We can show them, in this matter,
That they're wrong:
At expense why be complaining
When in pocket one is gaining?
For the roads that knit the nation
Make it strong!"



Seattle Public Library

The above map shows the federal aid highway system of California in its relation to other state highways. The roads shown on this map constitute the present state highway system, except in one or two minor particulars where the federal aid system includes short sections not designated state highways.

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CALIFORNIA HIGHWAYS

A BULLETIN ISSUED BY THE CALIFORNIA HIGHWAY COMMISSION FOR THE INFORMATION OF ITS EMPLOYEES AND THE PUBLIC

Vol. 2 NOVEMBER, 1925 No. 11

FEDERAL AID HELPS BRIDGE MIGHTY RIVER—Views showing progress on the Douglas Memorial Bridge spanning the Klamath River, near Requa, Del Norte County, a federal aid project on the Redwood highway. Its completion will give great impetus to the development of the northwest section of the state. Since the above pictures were taken rapid progress has been made and pouring of concrete on all arch rings and keys has been completed. (Bridge Department Photos.)

WEST JOINS NATION IN DEMANDING CONTINUANCE OF FEDERAL AID

EC 4 192

CALIFORNIA HIGHWAYS

HARVEY M. TOY, Chairman;
N. T. EDWARDS and LOUIS EVERDING, Commissioners.

ROBERT M. MORTON, State Highway Engineer.

W. F. MIXON, Secretary.

We are pleased to permit publication of any of the matter contained herein or to loan cuts, and this privilege is extended newspapers and periodicals without restrictions.

FRANK B. DURKEE - - - Editor
P. O. Box 1103, Sacramento, California.

Vol. 2. NOVEMBER, 1925. No. 11

CALIFORNIA HIGHWAY DEPARTMENT

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LOUIS EVERDING, Commissioner, Arcata

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FEDERAL AID FAIR TO ALL STATES

IN A RECENT ATTACK on federal aid for highways Governor Ritchie of Maryland contended that those states paying heavy income taxes receive back a smaller percentage in federal aid than do states whose income taxes are smaller. That is quite true, but it is based upon a sound American principle that has made a strong union of the states possible, that has been the foundation of our wonderful system of public schools and has, in fact, contributed to the general development and progress of the entire country.

Ever since the union of the thirteen original colonies the strong states have been aiding the weak and the strong counties have been helping those not so fortunate. The strong states have profited by this principle because the building up of the weaker states has made the big states stronger. It may be true that the weaker states appear to get more than their share in the distribution of federal aid for highways, but all states will benefit by the building up of a great national highway system, and those benefits will accrue more quickly through federal aid than if they await the individual resources of the separate states. Governor Ritchie's contention is no argument against federal aid; rather to any thinking person it is the best excuse and reason for it.—*Southwest Builder and Contractor,* Los Angeles.

CALIFORNIA FOR FEDERAL AID.

A COMMENDATORY WORD

(From the Redlands *Facts.*)

THE *Facts* believes that the State Highway Commission is functioning to the very large usefulness of the people of California. Certainly that is true in this part of the state, and we have heard similar expressions of opinion from other sections. Perhaps the system in effect has improved—perhaps any of several things—but certainly we are getting a fine amount of excellent road building and improvement. It is always a pleasure to speak a commendatory word and that word is a strong one in this instance.

Already Done.

The blushing bride-elect was rehearsing the ceremony that was about to take place.

"I shall expect you to give me away, dad," she said to her fond parent.

The latter looked up nervously from his paper. "I'm afraid," he murmured, "I've done it already. I told Herbert this morning that you had a disposition like your mother's!"

NOVEMBER 1925

California Highways

VOL. 2 NO. 11

West Joins Nation in Demanding Continuance of Federal Aid

A UNITED WEST has joined other states of the Union in demanding of congress a continuation of the federal aid policy. Born of a common desire for uniform action, the Western Road Association, representing those who speak for better highways in the western states, came into being in San Francisco during the week of November 9th. Gathered together at the All-Western Road Show were representatives of the mountain and coast states, both public officials and those engaged in private enterprise. The subject of federal aid and future highway construction was everywhere discussed and a decision to organize an association to represent the eleven western states was given unanimous approval.

Carl E. McStay, of the Automobile Club of Southern California, was chosen president; Harvey M. Toy, chairman of the California Highway Commission, was elected a vice president; and P. H. Curtis, of Los Angeles, secretary-treasurer. Representatives of the eleven states participating in the body will make up the board of directors.

At a meeting of the executive committee, it was decided that Mr. Toy should attend the Detroit convention of the American Association of State Highway Officials as spokesman for the new organization. He was given full authority to present the association's views, which were unanimously adopted, as follows:

1. Continuation of the federal aid program for a period of ten years with appropriations by congress of $100,000,000 annually;

2. Continuation of the forest highway program for a period of ten years with appropriations by congress of $10,000,000 annually;

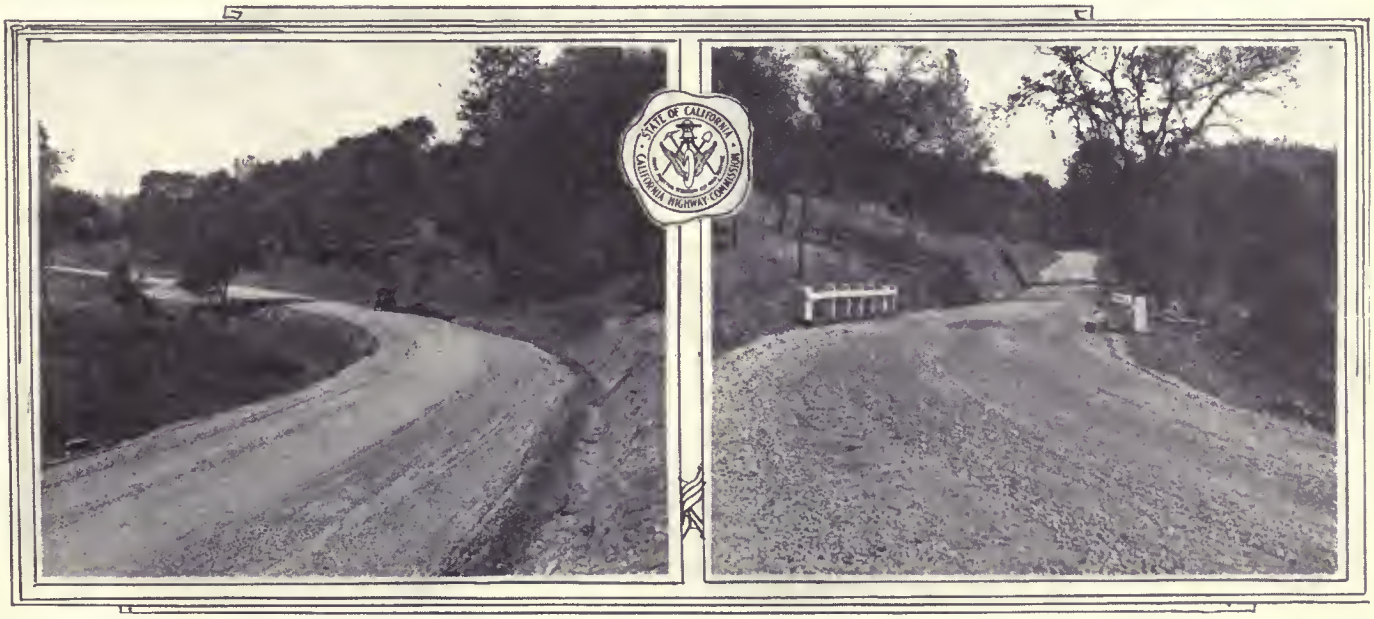
3. No change in the present method of disbursing federal aid, particularly with reference to the graduated scale.

Mr. Toy left for the East with a united West behind him. In this section of the country there is no divided opinion upon the subject of federal aid. The South, likewise, is giving it whole-hearted support as the most powerful influence for progress and good will since the days of reconstruction. From New England comes assurance of strong support, and, in the Middle West, representatives of such states as Indiana, Michigan, and Minnesota are emphatic in their demand that the cooperative plan for the construction of a great system of national highways shall not be disrupted by failure of continued federal support.

IN EFFECTING an organization having for its object the promotion of federal aid, the West is not sectional. It is the declared purpose of those who gathered in San Francisco to bring the merits of federal aid to the attention of the people of all the states. The West wants its highways built, and is straining every resource to that end, but it is just as anxious for completion of the transcontinental highways that will link the Atlantic with the Pacific. Highways through the coast and adjoining states, where more is being spent per capita for roads than in any other section of the country, will not reach their highest point of usefulness until connected up with the interstate systems of the Mississippi Valley and the eastern seaboard.

It is the old story of the railroad over again. The Central Pacific was of little value to the people of California and

(Continued on page 10.)



ALPINE HIGHWAY ABOVE JACKSON—No wonder the people of Jackson are pleased with the new section of the Alpine highway, east of that city, toward which they contributed $10,000. The views were taken by Division X following the recent acceptance of the contract. The road has an eighteen-foot width of grade, in addition to drainage ditches, and a crushed rock surface. The alignment of the old road has been greatly improved.

WIDENING AND THICKENING OF STATE HIGHWAYS

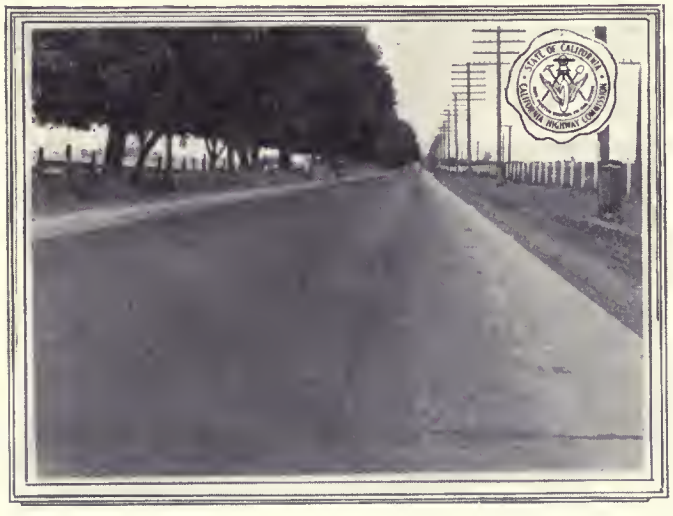
By R. M. Morton, State Highway Engineer.

RECONSTRUCTION of already improved highways, since the enactment of special revenue measures in 1923, has, in California, assumed a position of high importance in the work of the State Highway Department. By legislative action at the 1923 session, the revenue available for maintenance and widening was doubled when the gasoline tax of two cents per gallon and the nominal registration fee were substituted for the former horsepower tax.

The Highway Department this year will receive as its share from these sources (one-half the net collections) considerably over $9,000,000. The law requires that this fund be expended for maintenance, repairs, widening and reconstruction of state highways. About 60 per cent is available for major widening and reconstruction. The remainder is necessary for general maintenance. (Maintenance funds will have to be increased somewhat next year when all traversable routes will come under state jurisdiction.)

Several Plans Followed.

The Highway Department follows several plans in the widening and reconstruction of pavements. The type to be used on a specific project is chosen after a study of the physical features. Availability of materials, condition and width of pavement, alignment, grades and soil conditions enter into the choice of type. The present and probable future traffic are considered in planning the width.



NEW SHOULDERS IN YOLO COUNTY—View of new six-foot flush cement concrete shoulders recently placed on the state highway between Davis and the Woodland Wye, Yolo County. This section now has a twenty-seven-foot width of pavement and, in addition, a two-foot rock shoulder at either edge, making a thirty-one-foot roadway. The county cooperated with the state in financing the improvement. (Photo by Div. X.)

Most of the original pavements built by the state are of Portland cement concrete, 15 feet in width and from 4 to 5 inches in thickness. Many miles of county-built pavements of varying types and widths, generally of light construction, have been incorporated into the state's system.

Widening work includes concrete shoulders built flush with the existing pavement; raised concrete shoulders and asphalt concrete surfacing; asphalt concrete shoulders and surfacing for the full width and second story concrete shoulders and resurfacing. In locations of light traffic and where suitable materials are available, oiled macadam shoulders are sometimes built.

Future Program is Large.

About 600 miles of state highway pavements have been already widened, of a total of about 2400 miles. At least 1500 miles more will require widening as fast as funds are available.

The original width of pavement constructed from five to fifteen years ago was 15 feet. This width becomes overstressed with a traffic in excess of 1000 vehicles per day. Corner breaks and settlement of the edges occur, and it is impossible to keep shoulders flush with the pavement. Our traffic counts indicate that a 20-foot pavement readily handles a traffic up to 6000 vehicles per day, and is not overstressed until 10,000 vehicles per day is reached. When the traffic exceeds that amount, additional widening or a second road is considered necessary. Often, however, this heavier traffic occurs in suburban districts where the building of a full width street, with curbs and gutters, is required, and a large portion of the cost is defrayed by the adjacent property owners. The width generally adopted for the average pavement reconstruction is 20 feet.

Where the existing pavement is in good condition, cement concrete shoulders 2½ feet wide and 7 inches in thickness are placed at either side of the existing 15-foot slab. In preparing subbase for this type of widening, the soil is excavated for several inches beneath the edge of the existing pavement to form a joint and give added strength to the edge of the old pavement. Most work of this nature contemplates future surfacing over the entire width of the pavement.

It is usually required that only one side of the highway be worked on at a time in order that there may be no interruption to traffic. During 1924 California completed about 26 miles of this type of widening at an average cost of $10,493 per mile. This also included the widening of grade from 21 feet or 24 feet to 30 feet and the extension of culverts.

Combination Proves Successful.

A type of widening and thickening which has proven successful is a combination of concrete shoulders and asphalt concrete wearing surface. The shoulder is laid 7 or 8 inches thick at either side of the existing concrete slab and raised about 3 inches above it. An asphalt surface not less than 2 inches in thickness is placed over the old pavement and extends into an offset built into the new concrete shoulder, thus making a perfect seal and water-tight joint.

This type of surfacing and widening is placed where the existing concrete base is still in fairly good condition but where it may be predicted that the end of its economic life is fast approaching.

WIDENED AND THICKENED PAVEMENT—Pavement in Solano County rebuilt with asphalt concrete for both shoulders and surfacing. The base is the old fifteen-foot concrete pavement. The new width is twenty feet.

About 180 miles of concrete highways have been widened and thickened by this method at an average cost of $22,400 per mile.

A variation of this type is the construction of asphalt shoulders instead of concrete shoulders. Under this method a base 2½ feet wide and 4 to 5 inches in thickness of asphalt concrete is placed at the side. This is followed with a leveling course of asphalt, and a wearing surface completes the job. The cost of this type of work on a typical project, which includes rather heavy grading quantities and the lengthening of many drainage structures, was approximately $30,000 per mile. For the paving alone, the cost is usually little less than the cost of an installation of concrete shoulders and asphalt center.

This plan has been successfully used on widening oiled macadam highways. The first step usually consists in placing a macadam foundation at the side of the existing oiled macadam highway and permitting it to remain open to traffic over a season. This is followed by the placing of a leveling course over the old pavement and the new shoulders, which is followed with a wearing surface of the same material. One typical project of this nature in 1924 cost about $24,000 per mile for an 8½-mile section.

Oiled macadam roads have been widened, thickened and leveled with asphalt concrete in varying widths. The thickness of the new surfacing usually varies from 1½ inches to 3 inches. The aim of such work is to improve riding qualities of the surface and utilize the old base as a foundation. Such work will average $10,000 per mile in cost.

"Second Story" Concrete.

The most costly type of reconstruction is the second story concrete. This consists of a slab of concrete usually 20 feet in width placed on and overlapping the edges of the original 15-foot pave-

SECOND STORY CONCRETE—A rebuilt pavement in Ventura County. The new twenty-foot slab was placed over the old fifteen-foot pavement. This was necessary to sustain heavy traffic. (Photo Div. VII.)

ment. For this work the standard thickness is a minimum of 5 inches in the center, increasing to 7 inches at the edge of the old slab and 9 inches at the outside edge. Special attention is paid to the subbase under the overlapping edge of the new pavement, and the extensions beyond the edge of the old pavement are reinforced with steel. Transverse and longitudinal joints are placed.

This type of resurfacing is usually chosen where the old pavement is broken and in poor condition, having reached the end of its economic life. About 78 miles of this type of reconstruction have already been installed at an average cost of about $31,720 per mile, including widening the grade and lengthening drainage structures.

Heavy Pavements Needed for Traffic.

California has widened state highways to widths of twenty, twenty-four, twenty-seven, thirty, forty and fifty-six feet. On one particular job a 24-foot asphalt surface on a concrete base was widened to 40 feet by means of 8-foot concrete shoulders on both sides, 8 inches in thickness with 10-inch edges. The old asphalt center was dressed up with a new asphalt concrete wearing surface. On this width of highway separated into traffic lanes by the appearance of the materials, the slow moving commercial traffic tends to concentrate on the shoulders at the side, leaving the center free for faster traffic.

The most costly completed section of state highway reconstruction was completed in 1924 near Los Angeles, with the cooperation of the county and an improvement district. The old 20-foot oiled macadam roadway was replaced with a street 56 feet wide between curbs. A subbase of decomposed granite was first placed, then a 7-inch Portland cement concrete base finished with a 2-inch asphalt concrete surfacing. This improvement cost approximately $150,000 per mile.

WE MUST BE ON THE ALERT

THOSE who want federal aid for highway construction continued must be alert for the agitation in the eastern states for its discontinuance is becoming more insistent. There are some eastern states in which the people do not believe they are getting as much out of federal aid as they should and unless the propaganda now being spread about is combatted they will gain the support of legislators who think they see in it a possible political issue.

Discontinuance at this time of federal aid when a system of national highways is just being developed would be most unfortunate. Without assistance of some sort the western states will be many years in building their portion of this national highway system because of their sparse population and expansive domain which requires a great mileage, much of it of very difficult construction. Concerted action by civic associations throughout the eleven western states for continuance of federal aid should be invoked at once.—*Southwest Builder and Contractor.*

It is time the big business men of this and every other community devote some of their time to planning for traffic conditions of the future and help lay out some traffic rules and regulations which will be national in scope and uniform in enforcement.—*San Francisco Examiner.*

SECOND STORY WORK IN SONOMA—Placing of new pavement on the Redwood highway, a reconstruction project. Tests show it to be some of the strongest concrete ever placed on the state system. (Photo Div. IV.)

Laboratory Develops Quick Hardening Concrete

By C. L. McKesson, Materials and Research Engineer.

STATE Highway Engineer R. M. Morton directed the research department, some months ago, to endeavor to develop a quick hardening concrete for emergency use on state highways. A product was desired which would be reasonable in price and which could be safely opened to traffic in a comparatively short time after placing. The results of experimental work at the laboratory indicate such a concrete can be had at a slight increase in cost over standard mixtures. Concretes were developed which, under favorable conditions, will withstand traffic in twenty-four to forty-eight hours.

In any test series a considerable number of individual test specimens are desirable, if averages are to be accepted as reliable. It was, therefore, necessary to confine this test series for quick hardening concrete to two brands of Portland cement and one brand of high alumina cement. The Portland cements selected were Santa Cruz, a standard commercial cement produced in northern California, and Victor Oil Well cement, a southern California product. These two cements were chosen because they gave highest seven-day compressive strengths in 1-3 mortar with Standard Ottawa sand.

The early and ultimate strengths of various brands of cement vary from time to time. The selection for this series of tests was made about one year ago on the showing of seven-day strengths at that time, and should not now be followed without further tests to determine present relative strengths.

Tests That Should be Made.

For use in quick hardening, the available brands should be tested at seven days, preferably in 1-2 mortar with and without calcium chloride as an admixture. The brand which shows the highest early strength should be chosen for use in quick hardening concrete. This practice of selecting a cement because of high seven-day strength would not be desirable in ordinary work, because high early strength does not necessarily indicate high ultimate strength. In this work, early strength is the primary consideration. All of the quick hardening mixes will be richer than usual and will have sufficient ultimate strength.

The suggested tests also will show whether calcium chloride should be added. Some of our cements show little, if any, beneficial effects from the use of this chemical; others show appreciably higher early strengths. Lumnite cement was included in the series as a representative of the new type of high alumina cement now being introduced on the market.

Portland Cement Concrete.

Mixtures were made up with each brand using six, seven, and eight sacks per cubic yard of concrete. The specimens were 6 x 6 x 12-inch prisms. Natomas gravel and Livermore sand were used in all tests.

In the preparation of these specimens, no refinement was practiced not obtainable in the field. The usual A. S. T. M. method of laboratory preparation of concrete consists of grading material separately for each specimen and of mixing each specimen in a separate batch. This was abandoned in this series because such methods could not be followed in the field. Concrete was mixed with a shovel on a platform in batches of six specimens each. The only refinement was in grading aggregate in two sizes, 40 per cent passing 2" and retained on 1" and 60 per cent passing 1" and retained on ¼". This could be done in the field and would undoubtedly result in greater uniformity in concrete. Water was accurately measured, but concrete was sufficiently wet for field use, slump 1⅛- to 1½-inch.

The results of these tests are shown in Table 1 and graphically in Figure 1.

QUICK HARDENING CONCRETE—TABLE I.

Table Showing Individual Breaks—Specimens 6" x 6" x 12".

Mixture	Batch No.	24-hour strength	48-hour strength	3-day strength	7-day strength	28-day strength
1. 6 sack Victor Oil Well without Cal. Chloride (1-1¾-3½ mix)	1	800	1580	.....	3091	4362
		.....	1720	.....	3286	5105
	2	.....	1730	2350	3377	4475
	3	795	1600	.....	3100	.....
		.....	1720	.....	2930	4516
Average	.....	797	1672	2350	3157	4615
2. 6 sack Santa Cruz without Cal. Chloride (1-1¾-3½ mix).	19	1061	1978	.....	2855	4124
		.....	1827	.....	3072	4428
	20	.....	1869	2186	2913	4530
		.....	.....	.....	2903	4358
	21	841	1416	.....	2416	4250
		.....	1522	.....	.....	.....
Average	.....	951	1722	.....	2832	4338
3. 6 sack Victor Oil Well with 2 per cent Cal. Chloride (1-1¾-3½ mix).	7	1270	1840	.....	2841	4167
		.....	1950	.....	3061	4167
	8	.....	1860	2328	3011	3841
		.....	.....	.....	3105	4075
	9	1440	2200	.....	3086	4300
		.....	2140	.....	.....	.....
Average	.....	1355	1998	.....	3021	4110
4. 6 sack Santa Cruz with 2 per cent Cal. Chloride (1-1¾-3½ mix).	4	1635	2240	.....	3569	4105
		.....	1940	.....	3616	.....
	5	.....	2370	2440	3286	4302
		.....	.....	.....	3225	4180
	6	1585	1950	.....	3292	4155
		.....	2090	.....	.....	.....
Average	.....	1610	2118	.....	3398	4185
5. 7 sack Victor Oil Well, with 2 per cent Cal. Chloride (1-1½-3 mix).	13	2190	3000	.....	4025	4700
		.....	2855	.....	3822	5236
	14	1870	2511	.....	3586	4405
		.....	.....	.....	3808	4742
	15	.....	3006	.....	.....	.....
		.....	2678	3160	4333	4783
Average	.....	2030	2810	.....	3913	4774
6. 7 sack Santa Cruz with 2 per cent Cal. Chloride (1-1½-3 mix).	10	2030	3030	.....	3961	5000
		.....	2880	.....	4016	4861
	11	.....	2750	3122	3900	4883
		.....	.....	.....	4097	4397
	12	2010	2730	.....	.....	.....
		.....	2910	.....	3722	4617
Average	.....	2020	2860	.....	3939	4751
7. 8 sack Santa Cruz cement with 2 per cent Cal. Chloride (1-1-3 mix).	16	2470	2847	.....	3894	4519
		.....	3017	.....	3844	4656
	17	2530	2878	.....	4344	.....
		.....	.....	.....	3833	4725
	18	.....	2742	.....	.....	.....
		.....	2997	3360	3917	5086
Average	.....	2500	2896	.....	3966	4746
8. 7 sack Santa Cruz without Cal. Chloride (1-1½-3 mix).	22	1219	1800	.....	2941	4530
		.....	2094	.....	3219	5122
	23	.....	2150	2847	3475	5120
		.....	.....	.....	3267	4472
	24	1078	1819	.....	.....	.....
		.....	2000	.....	2947	5222
Average	.....	1148	1973	.....	3169	4893

It will be noted calcium chloride materially increased the early strength of the concrete and that there is no difficulty involved in its use. It should be added to mixing water in the proportion of 2 pounds of flake calcium chloride to each sack of cement, or, if liquid calcium chloride is used, it should be on the basis of 1½ pounds of anhydrous calcium chloride per sack of cement. Professor Abrams, in Bulletin No. 13, shows that there is no retrogression in concrete due to this small amount of calcium chloride.

In this test series it was found that 2000 pounds compressive strength could be obtained in twenty-four hours using a seven-sack (1–1½–3) mix. Much concrete pavement has been opened

to traffic in twenty-one days with a lower strength. After forty-eight hours, the strength of this mixture was 2800 pounds.

Eight sacks per cubic yard (1–1–3) with calcium chloride, gave a somewhat higher strength in twenty-four hours, but the advantage was almost lost at forty-eight hours.

It is believed that the seven-sack mixes used in this test may be opened for use in forty-eight hours provided following conditions are carefully observed:

1. Use good coarse concrete sand.
2. Use well graded gravel or crushed stone.
3. Use a reputable brand of cement which shows high seven-day strength.
4. Use about six gallons of water per sack of cement.
5. Weigh or measure water for each batch and add one pound fourteen ounces (avoirdupois) calcium chloride crystals per sack of cement.
6. Mix thoroughly, place on wet subgrade and keep wet and protected for forty-eight hours.
7. Earth, curing paper covering or calcium chloride surface application would insure some further curing even after pavement had been opened to traffic.

High Alumina Cement Concrete.

The specimens for this test consisted of twenty-five specimens 6" x 6" x 12". The cement was obtained from the Atlas Lumnite Cement Company of New York. Livermore sand and Natomas gravel were used as in preceding tests. Grading and methods of manipulation were as described for Portland cement concrete.

Specimens marked B-25, B-26, and B-27 were from batches 25, 26, and 27, respectively. Each batch contained concrete for six specimens, was mixed by hand, and proportioned as follows:

7,000 grams water
15,096 grams Lumnite cement
29,808 grams fine aggregate
62,595 grams coarse aggregate
Slump 1½ inches

The mix was approximately 1-1.75-3.5 (loose measure) and yield was on basis of six sacks of cement per cubic yard of concrete in place.

Specimens marked B-28 were from a nine-specimen batch, with following proportions:

11,000 grams water
27,072 grams Lumnite cement
44,712 grams fine aggregate
93,892 grams coarse aggregate
Slump 1½ inches

This mix was approximately 1–1½–3 (loose measure) and yield was on basis of seven sacks per cubic yard.

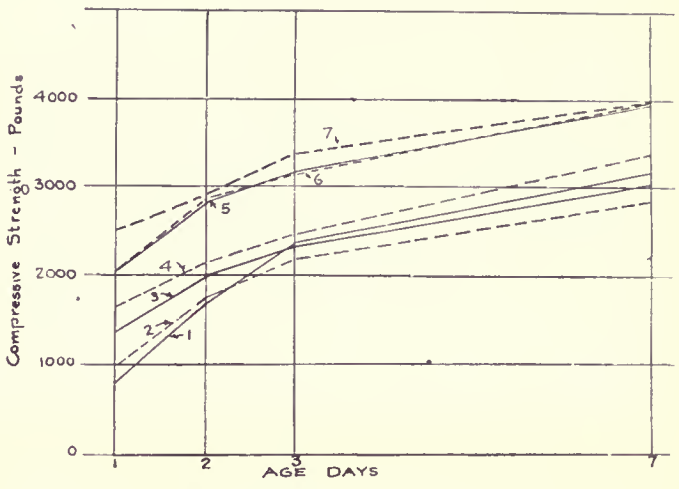
The strengths obtained are shown in the following tabulation:

COMPRESSIVE STRENGTH OF CONCRETE MADE WITH LUMNITE CEMENT

Batch No.	6 sack cubic yard						7 sack cubic yard		
	1 day	2 day	4 day	7 day	28 day	90 day	1 day	2 day	28 day
25		6050	5330	5020	5960				
		6040							
26	5360	5600	5240	5770	5340				
		5780							
27		5840		5220	6090	5320			
						5330			
28							5060	5790	5680
								6410	6790
								5950	5350
								5970	
								6030	
Average	5360	5862	5285	5336	5796	5325	5060	6030	5940

The total number of specimens was too small to give specimens for average values at all ages. At the time the tests were made, this cement was not on sale on this coast and the material for these tests was obtained by express, hence a limited quantity was available. More recent tests, however, indicate that these tests are

FIGURE 1.



TESTS OF QUICK HARDENING CONCRETE—For Highway Maintenance or Construction.

Reference numerals on curves indicate mixtures as follows:
No. 1. Victor cement—1–1¾–3½ mix (6 sack); no admixture.
2. Santa Cruz cement—1–1¾–3½ mix (6 sack); no admixture.
3. Victor cement—1–1¾–3½ mix (6 sack); 2% $CaCl_2$.
4. Santa Cruz cement—1–1¾–3½ mix (6 sack); 2% $CaCl_2$.
5. Victor cement—1–1½–3 mix (7 sack); 2% $CaCl_2$.
6. Santa Cruz cement—1–1½–3 mix (7 sack); 2% $CaCl_2$.
7. Santa Cruz cement—1–1–3 mix (8 sack); 2% $CaCl_2$.

typical of results to be expected of this unusual cement and the following may be stated as tentative conclusions:

1. Strengths of 5000 pounds per square inch may be obtained in twenty-four hours without curing, using the normal amount of cement (6 sacks per cubic yard).

2. There is apparently little to be gained by using a richer mix.

3. The tests indicate no increase of strength is to be expected in twenty-eight days. (The tests apparently show a slight retrogression.)

4. The series previously reported with tests included herein, make the following strength-cost comparisons possible.

Brand	Sacks cu. yd.	Compressive strength			Cost cement (and $CaCl_2$) per cy. conc.	Cost cement per sq. yd. 6" pave.
		24 hour	48 hour	28 day		
Lumnite	6	5360	5862	5796	12.75	2.12
Santa Cruz	*7	2020	2860	4751	5.15	.86
Victor Oil Well	*7	2030	2810	4774	8.54	1.42
Santa Cruz	*8	2500	2895	4746	5.88	.98
Santa Cruz	**6	951	1722	4338	4.17	.70

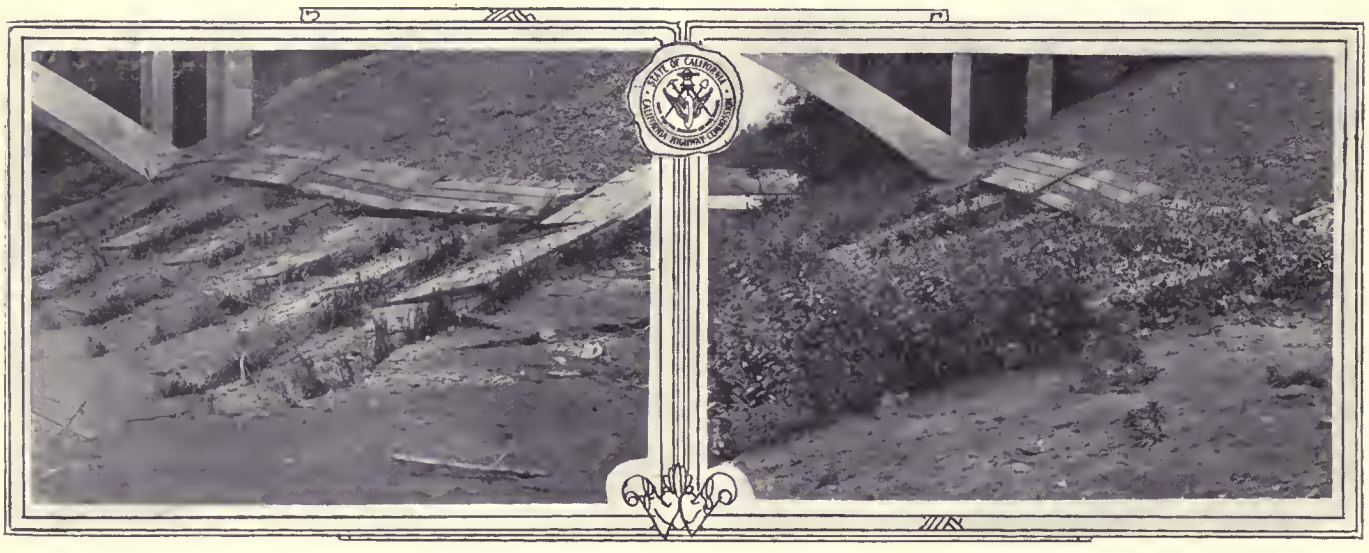
*With 2 per cent $CaCl_2$ admixture.
**Ordinary specification Paving Mix without $CaCl_2$.

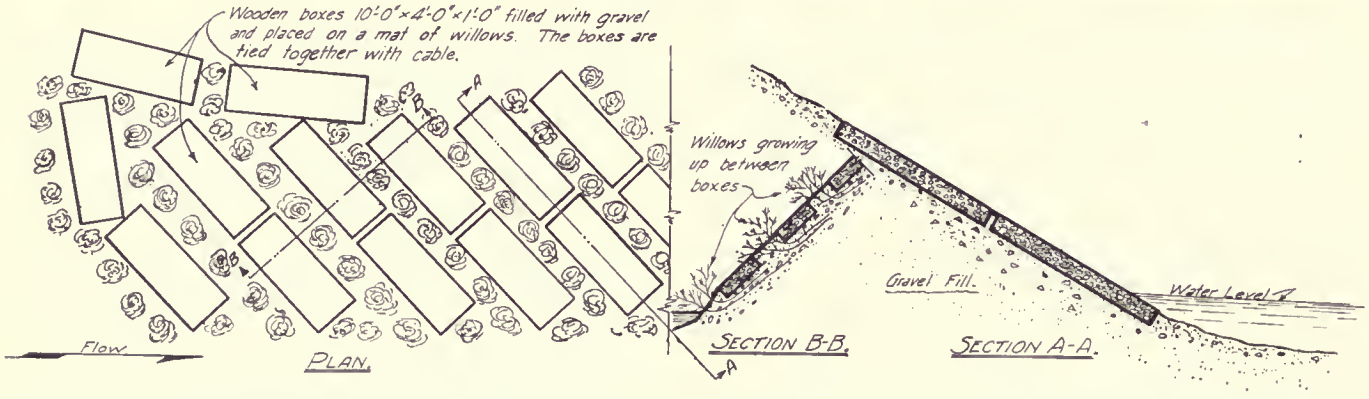
Assumed prices Cement Lumnite	$8.50 bbl.	Net F.O.B. Sacramento.
Assumed prices Santa Cruz cement	2.78 bbl.	Net F.O.B. Sacramento.
Assumed prices Victor Oil Well cement	4.72 bbl.	Net F.O.B. Los Angeles.
Assumed prices $CaCl_2$	40.00 ton	Net F.O.B. Sacramento.

This comparison suggests the use of Lumnite cement only where a very high early strength is imperative. Seven sack Santa Cruz with CaC12 gives 2000-pound concrete in twenty-four hours, 2800-pound in two days, and a very high twenty-eight-day strength at a cost of only 16 cents per square yard more than ordinary concrete, and for $1.24 less per square yard than with Lumnite cement. Such concrete might be opened to traffic in two or three days and with the low additional cost of 16 cents per square yard for six-inch

(Continued on page 8.)

BRIDGE DEPARTMENT USES NEW TYPE OF BANK PROTECTION




Wooden boxes 10'-0"x4'-0"x1'-0" filled with gravel and placed on a mat of willows. The boxes are tied together with cable.
Willows growing up between boxes
Gravel Fill.
Water Level
Flow
PLAN.
SECTION B-B.
SECTION A-A.

BANK PROTECTION WORK, VAN DUZEN RIVER—*Left,* showing placing of boxes to protect newly planted willows. The boxes are cabled to the abutment of the bridge and catch silt, protecting the young trees. *Right,* the willows after five months of growth. Below is a sketch showing details of the method of constructing and placing this type of bank protection which is being used in Humboldt County. (Photos by Bridge Department.)

By L. D. Packard, Bridge Department.

A NEW PLAN for protecting banks, a departure from the usual type of willow protection work, is being tried by the Bridge Department at the approach fill at the south abutment of the Van Duzen River bridge, on the Redwood highway in Humboldt County.

Timber boxes 1' x 4' x 10', constructed from 2" material, were placed on top of a mat of willows, as shown in the accompanying sketch and photographs. The boxes are designed to prevent the willows from being washed away before they have grown to sufficient size to withstand destructive action of flood waters.

The boxes were set at a 45° angle to the flow of the stream and at an angle of 15° or 20° to the stream surface. When placed in this manner, they cause silt to be deposited on the young trees, materially aiding their growth. To prevent the boxes from being washed away, they were filled with coarse gravel, fastened together with cables, and anchored to the bridge abutment.

The willows, when planted, were placed with the small ends pointing up stream. Cuttings of not to exceed one inch in diameter were used.

As necessary materials were readily available, the plan proved economical. The total cost was $247 for twenty-five boxes, or $9.88 per box installed. The protection was placed during March of this year. Despite two rises of the river since that time, the willows, on September 1st, showed a growth of about two feet in height. By the time the next highway water occurs, they should be well rooted.

It was at the suggestion of Commissioner Louis Everding that this type of protection was used. He has been familiar with its effectiveness along Mad River, Humboldt County, where the plan has been followed for six years by the Northern California Redwood Company. The results so far, the bridge department believes, justify the recommendation of the commissioner.

QUICK HARDENING CONCRETE

(Continued from page 7.)

pavement (or 19 cents for 7-inch pavement) might be economical for use on paving projects and in structures, as well as in patching.

Lumnite cement is now carried in stock on this coast and the very high strength developed in the first twenty-four hours will doubtless render it of great value where high strength concrete is required and immediate use is of prime importance.

When the headlights are out and the driver "lit up," the undertaker smiles.—St. Paul *Herald.*

CALIFORNIA FOR FEDERAL AID.

FIELD TESTS FOR DETERMINATION OF ADVERSE SOILS

By C. S. Pope, Construction Engineer.

FROM TIME TO TIME it is desirable for resident engineers to be able to determine whether or not soils which are available for paving foundations are suitable for the purpose. The following rather simple tests have been in use for some time and are considered reliable for the determination of adverse soils.

The lineal shrinkage test, which was first used many years ago on work in Los Angeles, still holds a valuable place in determining the qualities of soil which may render them unfit for foundations, while the method of determining moisture equivalent, as developed by Mr. Rose of the Bureau of Public Roads and first used extensively on road work by Mr. McKesson, replaces the more cumbersome laboratory methods heretofore in use.

A description of the two tests follows:

MOISTURE EQUIVALENT.

Except in cases of doubt, it is not always necessary to submit soil samples to the laboratory. A common method of testing the acceptability of a soil is to determine the so-called moisture equivalent percentage or, in other words, its propensity for holding water. The following field method will be sufficiently accurate to indicate the quality of subgrade materials in this respect, or for supplying the data for division engineers' preliminary reports.

Procedure.—Thoroughly air-dry and pulverize a 500-gram (or if more convenient a 20-ounce) sample of soil to be tested. Remove all pebbles larger than ⅛ of an inch, then slowly and uniformly wet the sample to the point of saturation, that is, until the addition of any more water would cause the same to remain unabsorbed on the surface of the mass. It is imperative that this point be carefully determined as much will depend on the investigator's judgment.

The final consistency of the mixture should be about equal to that of putty and such that it can be easily kneaded and compacted with a spoon or spatula. Next carefully weigh the sample. *The moisture equivalent percentage is the difference between the wet and dry weights of the sample computed as a percentage of the dry weight.*

In general, when the moisture equivalent percentage is less than 20 per cent, the soil is satisfactory for subgrade. When between 20 and 30 per cent, the soil is only fair for subgrade and when it exceeds 30 per cent, the soil will make poor subgrade and some form of treatment probably will be necessary. When the resident engineer obtains results of 20 per cent or over, he should report to the division engineer for advice.

EQUIPMENT NECESSARY.

1 agate basin; 1 100 c. c. burette; 1 pair suitable scales; and 1 spoon or spatula for mixing.

LINEAL SHRINKAGE.

Soils which shrink or swell under varying water content, thereby causing displacement of the subgrade, are a detriment to the life of a road surface. Resident engineers are cautioned to be ever on the alert for the appearance of such soils. Their presence in the work very probably would nullify much of the extreme care taken later with the road surface and cause its early disintegration.

The following field method of determining the percentage of lineal shrinkage of soils will be sufficiently accurate to indicate the quality of materials in the subgrade:

Procedure.—Slowly and uniformly wet a sample of soil weighing about twelve ounces to the point of extreme saturation, as in the previous test. The final consistency of the mixture should be such that it can be easily kneaded and compacted. Pack as much of the sample as is needed with a wooden tamper in ½-inch layers in a galvanized iron or oiled wood mould, approximately 1" x 1" in cross section and either exactly 10 inches or else 12½ inches in length. The mould may vary from 1" x 1" to other satisfactory dimensions, but a length of either 10 or 12½ inches is recommended since a 10-inch length will give 1 per cent on a 1/10 scale and a 12½-inch will give 1 per cent for each ⅛-inch on a foot rule. Push the sample free of the mould on to any flat smooth surface. After drying the specimen thoroughly, carefully measure the length.

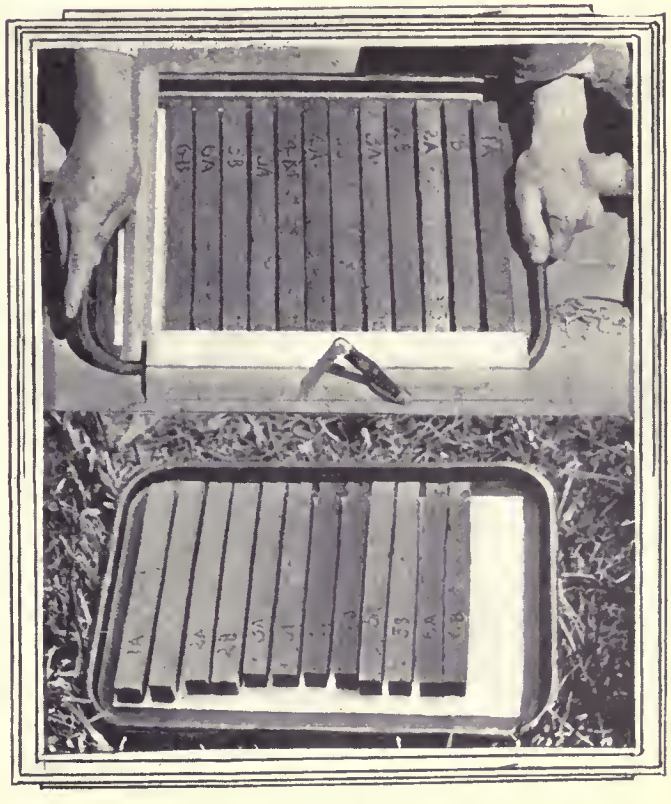
The drying should be done on a bed of dry sawdust or similar material to prevent warp. The specimen should also be turned over from time to time to secure uniform drying on all sides. *The lineal shrinkage percentage is the difference between the wet and dry lengths of the specimen computed as a percentage of the wet length.*

Usually, it is desirable to cast two or three test bars from each sample of soil for check purposes.

When the lineal shrinkage percentage is greater than 5 per cent (which corresponds approximately to a moisture equivalent of 30), special precautions should be taken to insure the road surface against failure due to movement of the subgrade. When such results are obtained, the resident engineer should report immediately to the division engineer for advice.

EQUIPMENT NECESSARY.

One galvanized iron or oiled wood 1" x 1" x 12½" mould (open two sides); and one carpenter's foot rule.



Examples of Soil Tests.

ELIMINATING CURVES ON THE RIDGE ROUTE

THE RIDGE ROUTE proper, between Los Angeles and Bakersfield, follows a new location where there was no previously existing highway. Its original location, which has numerous blind and sharp curves, was deemed adequate for traffic at the time the road was planned and built, but here, as elsewhere, tremendous increases in traffic are demanding wider and straighter roads.

The California Highway Commission for the last two years has allotted a considerable sum from the gasoline tax funds for widening and straightening work on the Ridge route. State forces began work at the Castaic school in May, 1924, and at the present time the widening work has been extended northward a mile beyond Big Swede cut, a distance of 17.5 miles.

Sight distance at "blind" curves is being improved and hazardous points removed, the excavated material being used to widen shoulders and fills. While the work is intended primarily to remove dangerous points, the alignment is being improved as the work progresses. A striking example is the Callahan line change, where one curve of 1500 feet has been substituted for seven short and sharp curves of varying degrees of radius.

The work has progressed to a point where paving of line changes is possible. Bids for the paving work will be opened in Sacramento on November 30th.

Cost is Low.

About 135,000 cubic yards have been moved to date at a cost of $0.47 per yard. This cost is considered low, taking into account the scattered character of the work and the further fact that traffic must be handled in safety and without delay. The circumstances make state forces peculiarly adapted for the work.

Superintendent M. L. Sullivan is in charge of a twenty-man crew which is operating a three-quarter-yard P. and H. power shovel and a small fleet of dump trucks.

Frequent users of the Ridge route, particularly motor transportation companies, have not complained of the manner in which traffic is being handled but on the other hand have commended most highly the work accomplished.

The accompanying illustrations show the character of the work being done in northern Los Angeles County.

IMPROVING THE RIDGE ROUTE—Motorists using the Ridge Route between Bakersfield and Los Angeles are commending the work being done by state forces under the direction of Division VII. Curves are being widened or eliminated by a twenty-man crew and a power shovel. Work has extended over seventeen miles of highway to date. (Photos Div. VII.)

WEST JOINS NATION IN DEMANDING CONTINUANCE OF FEDERAL AID

(Continued from page 3.)

Nevada until its rails joined those of the Union Pacific at Promontory Point, bringing about a connection with the developing railway systems of the East.

The West sincerely believes the great transcontinental highways are the concern not of the western states alone, but of the whole nation; that they are necessary in the interests of national development and social solidarity. It is this view of the federal aid situation that the Western Road Association will endeavor to present to the people of the country.

HOW MANY AUTOS ARE THERE?

Throughout the length and breadth of this country there are 17,740,236 automobiles, according to recent statistics. Startling as this figure is, it scarcely suggests the amount of time saved due to the rapidity of modern transportation. So many machines—there are two million more cars than telephones in the United States—indicate that ownership of an automobile is necessary to fully enjoy the advantages of healthful recreation.

And, after all, our health comes first. Without it no pleasure could be derived—life would be scarcely worth living. An automobile is the best form of health insurance.

CALIFORNIA FOR FEDERAL AID.

STATE REAL ESTATE MEN BACK FEDERAL AID

THE CALIFORNIA Real Estate Association, during its recent state convention in Fresno, unanimously adopted resolutions asking congress for increased appropriations for a continuation of federal aid to the states for highway construction. The national association of realty men was called upon to take similar action.

The resolutions are as follows:

WHEREAS, Construction of highways is necessary for the continued development and prosperity of the country; and,

WHEREAS, The policy of congress in extending aid to the states for the building of highways has resulted in the designation of a national system of highways connecting all the states; and,

WHEREAS, Without federal aid, highway construction in the sparsely settled public land states of the west can not be continued, thereby indefinitely postponing completion of urgently needed transcontinental highways; therefore,

Be it resolved by the California Real Estate Association, in conference assembled at Fresno, California, this eighth day of October, 1925, That we hereby urge upon congress the continuation of the present policy of the federal government; and,

That we favor increased rather than decreased appropriations for aid to the states in highway construction; and

That we call upon the National Real Estate Association to take similar action in support of the federal aid policy; and,

That we urge the representatives in congress and the United States Senators from California to support continued federal aid appropriations during the coming session of congress.

AN ALL NIGHT TOWN

WHAT highway building is doing for the country town is discussed by the Banning (Riverside County) *Record*. Twenty years ago the present state highway was a dusty street, now it is a busy, paved business section. From a sleepy village Banning has changed to an "all night town." Says the *Record*:

Banning has made a "hit" with travelers by maintaining night and day service. The motorist at any hour may obtain here everything from a quart of oil to a spare tire or a midnight lunch. The bright lights of the city welcome the traveler from out of the darkness and stillness of the desert and one can almost hear the chimes playing "Home Sweet Home."

Truck men appreciate the night service to the full extent. These men leave the Imperial Valley late in the day and make the long run into Los Angeles at night, arriving there with perishables for the early morning market.

The importance of Banning as a supply station has only begun. Its development in this line will be steady.

PROMISES FULFILLED

(From the Brawley News.)

WITH WORK in progress on the Brawley-Imperial state highway, the El Centro-Holtville sector of the same road and between Holtville and the Highline, in addition to the straightening of the Mountain Springs grade, a road building program unprecedented in this portion of the county is under way.

Several hundred thousand dollars are being spent by the State Highway Commission on these various roads in Imperial County, an indication that the Richardson administration is fulfilling its promise to complete at the earliest possible date the through highways. In previous times, something of a battle royal occurred when any attempt was made to induce the State Highway Commission to spend a cent in Imperial County.

The Richardson administration won't get many votes in this county as a result of its highway building. The county's vote is negligible compared with that of other districts, but the Governor is attending to the business of the state regardless of vote-catching schemes and this is one indication of his system.

Good roads don't cost—they save.

TRAFFIC LANES ON PENINSULA HIGHWAY—Plans being tried in Division IV to bring about maximum use of wide pavement. (Photo Div. IV.)

TRAFFIC LANES ON PENINSULA HIGHWAY HELP TO SPEED UP TRAFFIC

A NOVEL METHOD is now being tried in Division IV in an effort to bring about a more efficient use by traffic of the thirty-six-foot pavement on a portion of the Peninsula highway immediately adjacent to the city of San Mateo, San Mateo County. Three traffic strips have been painted longitudinally with the pavement in the following manner:

One strip 4½ inches wide was painted down the center line of the pavement and two additional strips, with 9′ 6″ clearance, on either side of the center line strip. All three strips were painted on the asphalt concrete surface which is slightly over 20 feet wide, leaving the two 8-foot strips of bare concrete shoulder on either side of the old pavement, or a total of 8′ 6″ outside of the traffic strip. The width of lanes are, therefore, outside strips, 8′ 6″; and the two center lanes, 9′ 6″.

Slow moving traffic is expected to confine itself to the outside lanes, leaving the central two lanes for the fast automobile traffic going in either direction. Local and state traffic officers have promised to assist in directing traffic in accordance with this plan.

Tread lightly, my friend, this spirit has fled.
On earth he was Hiram Begum;
He sat at the wheel
Of his automobile,
After downing a gallon of rum.

ROADSIDE WATERING PLACE—Fountain built on the highway right of way near Sonora, Tuolumne County, with funds furnished by the Lions Club of that community. Its water supply comes from a nearby spring. Plans were furnished and the work supervised by Division X.

WHAT THE DIVISIONS ARE DOING

DIVISION I.

HEADQUARTERS, WILLITS.

T. A. BEDFORD, DIVISION ENGINEER.

Counties of Del Norte, Humboldt, Mendocino, and Lake.

DEL NORTE COUNTY has again stepped forward and has made a payment to the Commission of $2,000 to aid in the building of a section of the Roosevelt highway along the coast, immediately south of the Oregon Line. Plans for this work have been forwarded to headquarters. The Supervisors of Del Norte County, on several occasions, have demonstrated their confidence in the methods of the state by voluntarily advancing funds for construction and maintenance of state routes in Del Norte County.

Survey work on that portion of the Tahoe-Ukiah highway along the northeast shore of Clear Lake is progressing rapidly. As soon as a location is finally decided upon, it is understood Lake County plans to grade that section between Clear Lake Beach and Stubbs Ranch. When this connection is completed, it will be possible for traffic to make the entire circuit of Clear Lake, a dream of Lake County for many years.

Division I Culverts Inspected.

For a week and a half representatives of Division I and the Sacramento testing laboratory "looked under the roads" in this section of the state. Many drains in all parts of the division were examined, and it is believed much valuable data were obtained relative to the life of culverts under the severe conditions prevailing in the north coast counties. It is evident some mistakes have been made in the original locations, and that maintenance methods can be changed to advantage.

DIVISION II.

HEADQUARTERS, REDDING.

H. S. COMLY, DIVISION ENGINEER.

Counties of Siskiyou, Modoc, Trinity, Shasta, Lassen, Tehama, and northern Plumas.

MODOC COUNTY and the state are cooperating in the construction of two miles of graded road from the Cedarville causeway eastward to the Nevada line. This is one of the interstate connections added to the state highway system by the legislature. The work will make the road from Alturas via Cedarville into Nevada passable during winter months. The work, which is in charge of Superintendent J. W. Clark, will be completed in time for traffic during the present winter.

A survey party is now completing the location of 3.5 miles of highway on the county road between Alturas and Lakeview, Oregon. It is proposed to complete the plans for this work during the winter and to begin construction work next spring. The work will be financed by Modoc County. This road is an interstate connection which has been included in the California federal aid system, and, doubtless, will be made a state highway in the future.

Plan Crossing of Lake.

Division II and the engineers for the Great Western Power Company are engaged in working out plans for a causeway across the upper end of Big Meadows, Plumas County, on the Susanville lateral. A section of this road, it is expected, will be flooded by Lake Almanor when the raising of the dam on Feather River is completed. The raising of the water level of the lake affects 7000 feet of highway. The direct location of the highway across the lake bed will save 4.5 miles of distance, as compared with a road around the upper end of the enlarged lake.

The Nevada Contracting Company, engaged in the reconstruction of eleven miles of the state highway in the Sacramento Canyon, is now making the great cut at the Salt Creek divide which may reach an ultimate depth of 100 feet. It will be one of the deepest highway cuts in the United States.

DIVISION III.

HEADQUARTERS, SACRAMENTO.

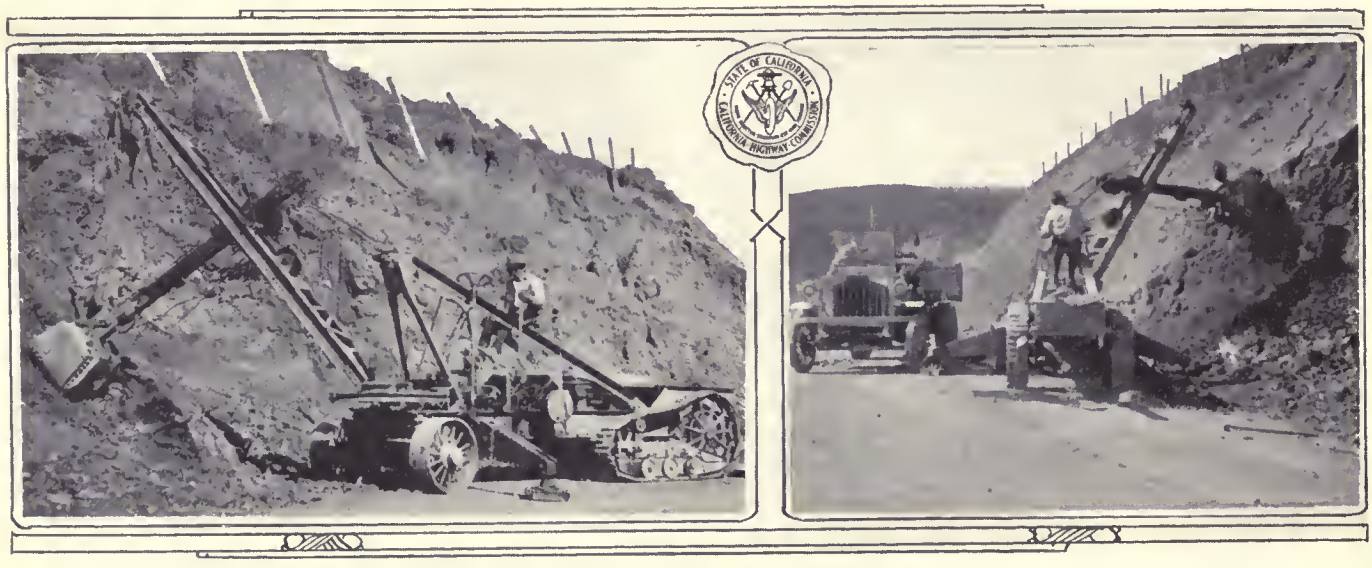
F. W. HASELWOOD, ACTING DIVISION ENGINEER.

Counties of Butte, Colusa, El Dorado, Glenn, Nevada, Placer, southern Plumas, Sierra, Sutter, Yuba, and northern Sacramento and Yolo.

GRADING of the eight-mile section of the Victory highway between Colfax and Gold Run, Placer County, has been completed by Contractor C. R. Adams, the work having been finished ahead of schedule. Giddings and Whyte are placing a one-way surfacing on a part of this project to provide for winter travel.

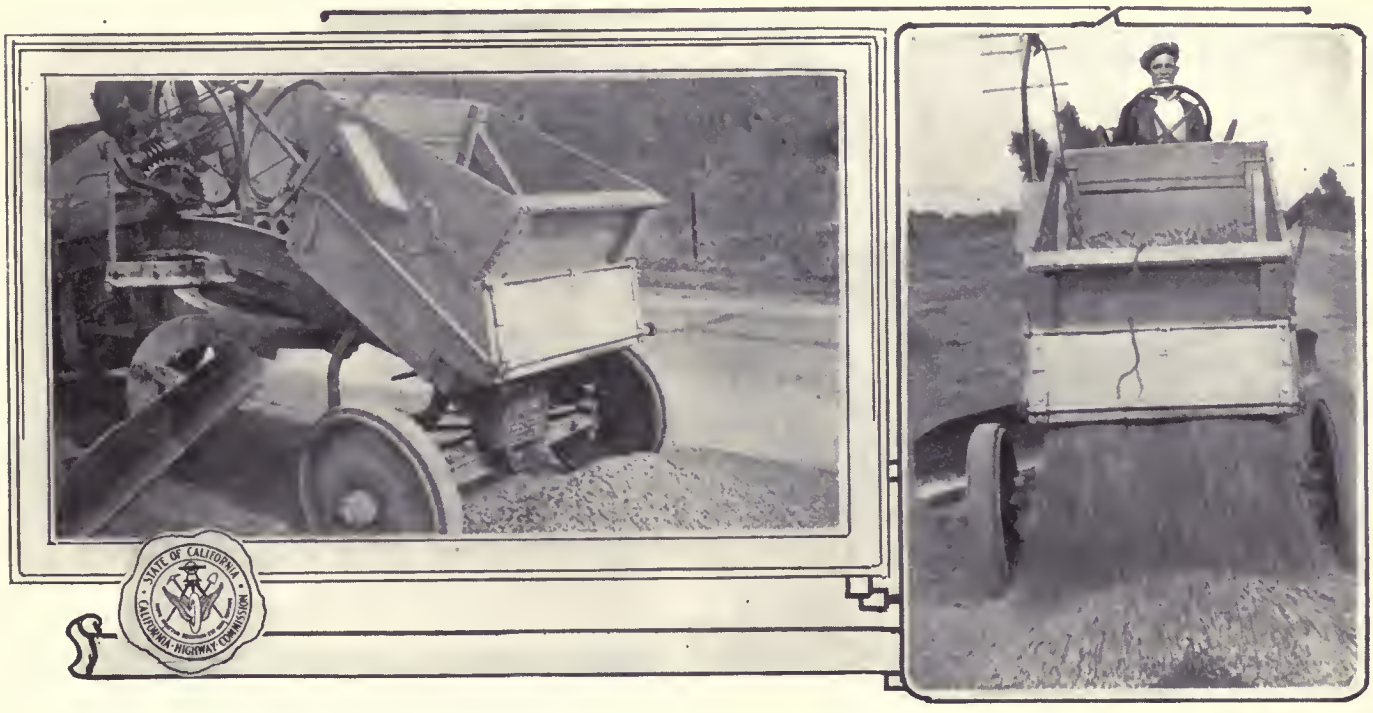
The Nevada Contracting Company has completed about 1.5 miles of grading on the six-mile contract between Floriston and the Nevada line. Fair progress is being made.

The Irey and Holden contract for grading and surfacing work above Placerville, on the Lake Tahoe highway, has been extended



ONE-MAN SHOVEL ON THE SKYLINE—Division IV is well pleased with the performance of the Insley one-man power shovel. The views show one of these machines in service removing small slides from the Skyline boulevard in San Mateo County, where they have proved effective equipment. (Photos by Div. IV.)

GRAVEL HOPPER ATTACHED TO GRADER FOR SHOULDER WORK



MAINTENANCE AID—Views of gravel hopper which has been attached to a grader by a Division II maintenance foreman. It aids in patching rock shoulders, one man operating the entire outfit. The blade immediately spreads the rock to a true grade. (Photos by Div. II.)

DIVISION TWO has furnished the BULLETIN views of a gravel hopper attached to a one-man grader which is in use by the maintenance crew in the vicinity of Red Bluff, Tehama County. The outfit was developed by Superintendent E. L. Stump, who reports it economical and serviceable in keeping rock shoulders flush with the pavement and in good travelable condition.

The hopper will hold a third of a yard of crushed rock or gravel and is so adjusted that small amounts of rock may be dropped here and there, where needed, as the grader moves along the shoulder. Small depressions are filled with surfacing which is immediately spread to a true grade by the blade of the grader.

The extra weight of the hopper and contents does not seriously overload the equipment, the division says, but rather has a beneficial effect in steadying the grader, making the blader operation more thorough and effective. The cost of the outfit complete and installed is about $25.

DIVISION REPORTS

to cover the surfacing of the entire 5.8 miles and it is expected that the work will be completed before the first of the year.

By the time this bulletin is off the press, the concrete paving between the American River bridge and North Sacramento will have been completed. The underpasses are finished and opening of the improvement to traffic early in December is expected.

Clearing of brush and trees along the west shore of Lake Tahoe, between McKinneys and Tahoe City, has been authorized. The clearing is preparatory to improvement of this section of the state highway, probably next summer. If weather conditions permit the work will be continued throughout the winter.

Bridges to be Built.

Informal contracts have been awarded to the division for the construction of a timber pile trestle bridge on the Willows-Oroville lateral in Glenn County and for two similar spans on the Chico-Orland highway in Butte County. The bridges were made necessary by damage done during the high water of last winter.

Storage sheds for equipment are being constructed at the recently acquired maintenance station sites at Tahoe City, Myers Junction, and Truckee, all in the Lake Tahoe section.

Funds have been authorized for surveys for the elimination or improvement of twenty-seven reverse curves on the main trunk highway in the Sacramento Valley, where jogs around railroad property were necessary, for the realignment of the highway near Placerville, and near the Sylvan School, between Sacramento and Roseville.

Surveys have been authorized of the following county bridges on trunk highways in Division III, looking to their replacement by modern state-built structures: bridge over Auburn Ravine, south of Lincoln; Pine Creek bridge north of Chico; Stone Corral Creek and Funks Slough bridges in Colusa County; and the Wilson Creek bridge in Glenn County.

DIVISION IV.

HEADQUARTERS, SAN FRANCISCO.

JOHN H. SKEGGS, DIVISION ENGINEER.

Counties of San Francisco, Marin, Sonoma, Napa, Contra Costa, Alameda, Santa Clara, Santa Cruz, and San Mateo.

THE WORK of widening to forty feet the state highway between San Bruno and Cypress Lawn Cemetery is progressing satisfactorily. The heavy cement concrete shoulder on the west side of the roadway has been finished and opened to traffic. The shoulder on the east side is now being completed after which the asphalt concrete wearing surface will be placed over the old pavement, completing the project. All curves are being superelevated. Where necessary, asphalt concrete wedges have been placed over a portion of the old pavement, preparatory to the placing of the surfacing.

Placing of 5.2 miles of embankment across the marshes from South San Francisco to San Mateo, on the Bay Shore highway, is rapidly nearing completion. The borrow material yet to be placed is considerably less than 100,000 cubic yards. The next step will be the placing of a surfacing which, it is hoped, will be a part of the 1926 program.

(Continued on page 14.)

DIVISION REPORTS

(Continued from page 13.)

Guard Rail Construction Under Way.

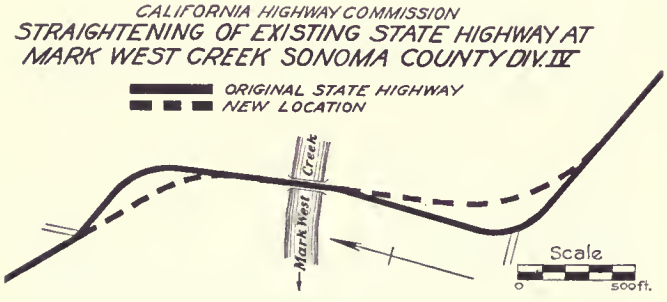
S. A. Martindale, contractor for the placing of 10,000 lineal feet of guard rail on the Skyline boulevard, has begun work near the Colma road.

Fair progress is being made by the Kaiser Paving Company on the contract for the placing of bituminous macadam shoulders either side of the existing pavement between San Pablo Creek and

WIDENING PENINSULA HIGHWAY—Shoulder of heavy concrete completed, work under way on opposite side of the highway. To super-elevate the curve, a wedge of asphalt concrete has been placed over a portion of the old pavement, preparatory to placing new surfacing. (Photo Div. IV.)

El Ciervo, Contra Costa County. Rocking has progressed from San Pablo to the west city limits of Pinole. Grading is being completed on Oleum Hill near the Union Oil refinery.

J. V. Galbraith, contractor, is rapidly nearing the completion of his reconstruction project between Santa Rosa and Healdsburg on the Redwood highway in Sonoma county. The new "second story" cement concrete pavement is being placed in two ten-foot widths. Some of the "breaks" on this project have shown very high strengths, probably the highest on any state pavement in California. Grading of line changes at Mark West Creek, and about



one mile north of Santa Rosa, is now under way. These line changes will be permitted to settle during the winter before a pavement is placed.

Traffic has been successfully handled during the summer on various detours over county roads and at the side of the highway.

Maintenance forces are making good progress on a section of heavy grading on the Boulder Creek road, leading to the California Redwood Park, in Santa Cruz County. The work is expected to continue until heavy rains make it necessary to close down operations for the winter.

DIVISION VII.

HEADQUARTERS, LOS ANGELES.

S. V. CORTELYOU, DIVISION ENGINEER.

Counties of Los Angeles, Ventura, Orange, San Diego, and eastern Kern, south of Mojave.

BUILDING of curbs and placing of concrete pavement on the Whittier boulevard reconstruction job, in Los Angeles County, is progressing rapidly. The new pavement is open to traffic between Montebello and the Union Pacific underpass. The latter is under construction.

Paving operations having been completed, placing of rock borders on the Jahn and Bressi contract, 5.6 miles from San Juan to Galivan, Orange County, is now under way. The concrete outfit has been shipped to Oceanside, San Diego County, where the same firm has another reconstruction contract under way. Grading is well along north of Oceanside.

Approximately two miles of twenty-foot pavement and nearly all grading has been completed on the San Onofre-San Mateo Creek line change, in San Diego County.

On the Malibu Ranch grading contract, Coast boulevard, Los Angeles County, all grading has been finished between Latigo Creek and Las Flores Canyon. Work is now under way at the westerly end of the contract and at Zuma Canyon.

Paving South of Newport.

Paving is well under way south of Newport on the Newport Beach-Laguna project.

Two power shovels and a large grading outfit are at work on the Laguna-Serra grading contract, which will complete the opening of the southern end of the Coast boulevard.

Traffic Cared for.

Work is going ahead rapidly on the widening and realignment of the Mountain Springs grade between San Diego and El Centro. The contractor is planning to double his forces in the near future. The work is being done without interference with traffic.

Dewey and Rawson have begun lengthening of culverts and grading preparatory to placing flush concrete shoulders on the Foothill boulevard between San Fernando and La Canada, Los Angeles County.

Work has started on the rebuilding and widening of the Middle

LABOR SAVING MAINTENANCE OUTFIT—A little pick and shovel work by the maintenance crew starts a small avalanche and fills the truck in short order. Outfit in use on shoulder widening work north of Santa Monica, Division VII.

Causeway on the Coast Route, north of Ventura. A part of the work includes three large box culverts which will be constructed to handle drainage.

DIVISION X.

HEADQUARTERS, SACRAMENTO.

J. C. McLEOD, DIVISION ENGINEER.

Counties of Amador, Calaveras, Alpine, Tuolumne, Stanislaus, San Joaquin, Solano, and southern Sacramento and Yolo counties.

CONTRACTOR J. F. Knapp is making rapid progress on the paving of the state highway through the town of Manteca, San Joaquin County. The state is paying for a twenty-foot strip in the center of the street and the property owners for the balance on either side to complete a full width pavement.

The new state pavement between Turner Station and the Stanislaus River has been completed and opened to traffic. Shoulder work and grading will be completed by the time this bulletin is off the press. C. W. Springer has been resident engineer on this project.

Progress is being made on the paving of the southern approach to Sacramento on the Stockton boulevard. Moving of the tracks of the Central California Traction Company to the center of the street has been completed.

Shoulders Improve Highway.

A marked improvement in the condition of the state highway between Davis and Woodland, and the Woodland Wye and Putah

BANKED CURVES—The original construction of the trunk highway through Solano County did not include superelevation of curves. Division X recently completed the banking of these curves and their repavement with asphalt concrete. The safety of the highway has been greatly improved.

Creek, is evident following the completion of placing of "flush" concrete shoulders. Two-foot rock shoulders have been placed at either side of the new concrete shoulders and the earth shoulders widened and considerably improved.

The Amador County Board of Supervisors has contracted with R. N. Murdoch to make improvements on the Mother Lode highway between Drytown and Amador City, in line with its policy of turning over the highway to the state in as good a condition as possible on January 1st. The contractor is now working between Central House and Drytown, on state work.

Maintenance Activities.

Funds have been allotted and work is now under way on a line change on the Ebbitts Pass highway, in Alpine County. The worst grades on the east side of the pass are being eliminated by a new location of the road.

Widening work on the Big Oak Flat road between Bucks Meadow and South Fork has been completed.

In San Joaquin County, a mile of oil macadam east of Clements, on the San Andreas lateral, has been rebuilt under the direction of Superintendent Clarence Bovey. Local residents have commented favorably on the improvement.

Curves on the trunk highway north of Stockton, between the diverting canal and the Calaveras River, have been superelevated and improved as to drainage.

HIGHWAY NEWS NOTES

C. S. POPE, construction engineer, has returned from an inspection trip through Oregon and Washington where he made a study of the latest highway design and practices of those states.

Earl McNeely, outfielder for the Washington Senators, visited old friends at headquarters and in Division III following his return from the east.

Division III reports W. H. Miller is now in charge of widening work at Lake Tahoe in the place of W. G. Walker, who has been ill.

J. W. Vickery, well known member of the Division III forces, is the father of a brand new son, who weighed 11½ pounds upon arrival.

Bureau Man With Division X.

N. W. Collins, formerly with the Portland office of the Bureau of Public Roads, is now a member of the Division X staff.

Miss Ruth Miles, chief stenographer, Division X, is touring Europe and the British Isles in company with members of her family. Miss Betty Bell of the Division of Water Rights has succeeded to her position.

Several radio sets have been installed in the Briceburg prison camp with funds raised by the San Francisco *Chronicle,* which accepted voluntary contributions for this purpose.

Southern News.

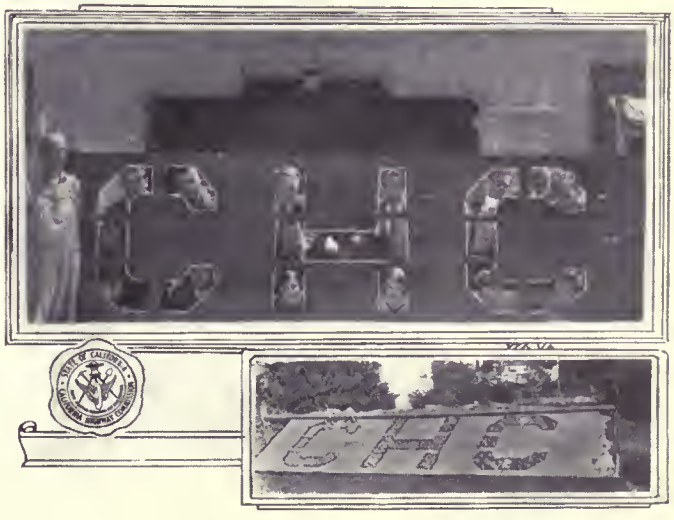
Fred R. Belknap has been promoted from instrument man to assistant resident engineer on the San Onofre-San Mateo creek line change in San Diego County, reports Division VII.

E. J. Saldine has been transferred from the Los Angeles office to the Mountain Springs grade project, as acting resident engineer.

It has just been learned that Miss Mayme Sullivan of the Purchasing Department recently became the bride of Mr. Earl Janak.

DIVISION I PROUD OF LAWN AND FLOWERS ABOUT OFFICE

THE BEAUTIFUL lawn and flower garden which surrounds the headquarters office of Division I at Willits, Mendocino County, is the special pride of the entire staff, but none takes greater interest in its appearance than T. H. Taylor, its caretaker. Taylor has just started the growing of a large C H C on the front lawn. He had prepared a large wooden form for the background of the letters until they are well started, but before it was put in place Mr. Bedford and his staff planted it to human faces.



DIVISION STAFF AT WILLITS—Mr. Bedford's helpers appropriate the caretaker's flower plot border to have picture taken.

STATE HIGHWAY FUND CONTRACTS (Bond Funds, Including Federal Aid)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE OCT. 9, 1925.						
446	III	Nevada	38	A	Across Truckee River 1 mile north of Polaris		Reinforced Concrete Bridge	Proctor and Cleghorn	$56,728 13	July 16, 1924	
					AWARDED SINCE OCTOBER 9, 1925.						
485	V	San Luis Obispo	2	E	Pismo to 1 mile south	0.88	Grade and Rock Surfacing	Collins and Seppi	68,602 50	Oct. 23, 1925	200
486	VI	Mariposa	18	G	Across Merced River		Reinforced Concrete Bridge	Otto Parlier	36,894 38	Oct. 23, 1925	150
487	VII	Los Angeles	60	A	Latigo Creek to Las Flores Canyon	6.70	6.3 miles P. C. Conc. Pavement; 0.4 miles Bit. Mac. Pavement	Ed Johnson and Sons	235,649 25	Nov. 13, 1925	125
					Sub-total	7.58			$397,874 26		
					PENDING AWARD.						
	VIII	Riverside	64	C	Desert Center to 4 miles west of Hopkins Well	21.00	Grading		31,207 50		200
					Total State Highway Fund Contracts Awarded and Pending Award	28.58			$429,081 76		

NOTE—Primary construction covered by the above contracts does not include funds obligated on cooperative forest highway projects, prison camp road activities, or day labor jobs not being done under contract.

STATE HIGHWAY MAINTENANCE FUND CONTRACTS (Including Gasoline Tax Fund)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE OCT. 9, 1925.						
M-63	II	Shasta	3	C	Across Salt Creek		Reinforced Concrete Girder Bridge	Nate Lovelace	$19,386 34	Mar. 12, 1925	
M-79	VII	Ventura	2	D	Across Ventura River		Reinforced Concrete Bridge Extension	Otto Parlier	26,997 19	May 20, 1925	
M-80	I	Humboldt	1	C, E, G,	Various		Painting Five Bridges	R. Zelinsky	56,952 00	May 20, 1925	
M-88	VI	Merced	32	C	6 miles east of Los Banos to San Joaquin River	10.00	Rock Borders	Kaiser Paving Company	26,289 00	June 17, 1925	
M-89	III	Placer	39	A	Tahoe City to Nevada State line	11.60	Crushed Stone Surface	Bishop and Brooks	26,901 00	June 17, 1925	
					AWARDED SINCE OCTOBER 9, 1925.						
M-103	V	Santa Barbara	2	J	Summerland to Montecito	1.40	Grade and Rock Suracing	McCray Company	77,885 15	Oct. 23, 1925	100
M-104	VII	Ventura	2	F	At Middle Causeway	0.10	Grade and Rock Surfacing	Edward W. Dahl	14,688 00	Oct. 23, 1925	75
M-105	VIII	Riverside	26	B	Beaumont to Banning	3.00	Portland Cement Concrete Pavement	Geo. Herz and Company	91,476 90	Nov. 13, 1925	75
M-106	VII	Ventura	2	B, C	Camarillo to Ventura	13.20	9.8 miles P. C. C. Pavement; 3.4 miles P. C. C. widening	H. H. Peterson	364,209 89	Nov. 13, 1925	200
					Sub-total	39.30			$704,785 47		
					PENDING AWARD.						
	VIII	San Bernardino, Riverside	19	B-A	Ontario to Riverside	14.60	Asphalt Concrete Pavement		232,912 08		150
					Total State Highway Maintenance Fund Contracts Awarded and Pending Award	53.90			$937,697 55		

NOTE—The above obligations charged against the State Highway Maintenance Funds do not include funds from these sources obligated for general maintenance and for specific betterments being done under day labor authorization.

PRACTICALLY all projects included in the 1925 program of the California Highway Commission, announced in detail last spring, have been placed under contract or advertised for bids. Various matters have delayed the work that remains to be undertaken. Engineering problems involved have required intensive study and have made it advisable, in some instances, to hold back work until the engineers were certain the best possible plan had been adopted. In other instances, rights of way have been difficult to obtain and condemnation suits, which required the preparation of lengthy descriptions of property, have had to be instituted.

It will be many months before all of the work placed under contract during the present year is completed. Already, the commission is working on plans for 1926, and bids have been asked on one project in order that construction may be started early in the spring. Careful consideration is being given the work to be undertaken next year on both new projects and reconstruction of existing highway. The detailed program will be announced by the commission in the near future.

Seattle Public Library

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CALIFORNIA STATE PRINTING OFFICE

CALIFORNIA HIGHWAYS

A BULLETIN ISSUED BY THE CALIFORNIA HIGHWAY COMMISSION FOR THE INFORMATION OF ITS EMPLOYEES AND THE PUBLIC

Vol. 2 DECEMBER, 1925 No. 12

ON THE SKYLINE BOULEVARD—A scene like this is hardly to be expected a few miles from the San Francisco city limits. The view was taken in the San Mateo hills on a section of state highway recently completed and opened to traffic. (Photo by A. W. McCurdy.)

Happy New Year

CALIFORNIA HIGHWAYS

HARVEY M. TOY, Chairman;

N. T. EDWARDS and LOUIS EVERDING, Commissioners.

ROBERT M. MORTON, State Highway Engineer.

W. F. MIXON, Secretary.

We are pleased to permit publication of any of the matter contained herein or to loan cuts, and this privilege is extended newspapers and periodicals without restrictions.

FRANK B. DURKEE - - - Editor

P. O. Box 1103, Sacramento, California.

Vol. 2 DECEMBER, 1925. No. 12

CALIFORNIA HIGHWAY DEPARTMENT

CALIFORNIA HIGHWAY COMMISSION

HARVEY M. TOY, Chairman, San Francisco

N. T. EDWARDS, Commissioner, Orange

LOUIS EVERDING, Commissioner, Arcata

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HIGHWAY OFFICIALS STAND FIRM FOR FEDERAL AID

CALIFORNIAN HEADS RESOLUTIONS COMMITTEE AT DETROIT MEETING.

WITHOUT a dissenting voice and with all states save Florida and Washington represented, the American Association of State Highway Officials, at its annual convention in Detroit, reiterated its position strongly endorsing the federal aid highway policy. Harvey M. Toy, of the California Highway Commission, was chosen chairman of the important resolutions committee, and the following resolution, offered by him, was unanimously adopted:

> Whereas, the appropriations now authorized by congress for the purpose of carrying out the provisions of the Federal Highway Act do not extend beyond the fiscal year to end June 30, 1927; and
>
> Whereas, appropriations beyond said fiscal year 1927 should be authorized for such periods in advance as to enable the state highway departments to so plan their construction as to best utilize such appropriations when they shall become available; now, therefore, be it
>
> *Resolved*, that it is the sense of this association that congress at its ensuing session should authorize further appropriations for said purpose for the fiscal years to end June 30, 1928 and 1929, respectively, and that the appropriations so authorized should be at the rate of eighty million dollars for the cooperative construction of rural post roads and eight million dollars for the construction of forest roads for each of said fiscal years 1928 and 1929.

Other Resolutions.

In addition to the above, the committee offered a number of important resolutions which were adopted by the convention, as follows:

> That no reduction be made in the present mileage of federal aid roads;
>
> That a change be made in federal aid practices providing for increasing the limits of aid in certain instances (Colton Bill, H. R. 6133, 68th Congress 2d Ses.);
>
> That a uniform system of marking roads be adopted;
>
> That the use be generally made of the uniform questionnaire to determine responsibility of contractors as reported by the joint committee on uniform questionnaires;
>
> That the state of New York and Governor Smith of that state be congratulated on the forward step taken in voting a bond issue of $300,000,000 for grade crossing elimination;
>
> That the salary of the chief of the Bureau of Public Roads be materially increased.

DECEMBER 1925

California Highways

VOL. 2 NO. 12

INPROVED QUALITY AND DESIGN INCREASE STRENGTH OF CALIFORNIA HIGHWAY PAVEMENTS

By R. M. MORTON, State Highway Engineer.

THE RAPID INCREASE in tonnage and volume of traffic carried by the highways of today has demanded that engineers exercise the utmost skill and ingenuity in providing additional strength without prohibitive increases in cost.

In the design of concrete pavements, there are two ways in which additional strength to withstand traffic impact may be secured. One method is to increase the thickness and to improve the design of the cross section so that the greatest strength will be at the point where loading is the heaviest. Increased thickness means increased cost and economic considerations prevent unlimited improvements in this direction.

The other method of increasing the strength and wearing power of pavements is by improving the quality of the concrete used in them, and, as this method gives added strength at a very slight increase in cost, it should be utilized as far as possible.

The early four-inch concrete pavements, fifteen feet in width, were laid with uniform thickness. Traffic ten years ago was light, passing of vehicles only occasional and much of the traffic moved along the center of the roadway. Increased volume of traffic results in vehicles meeting and passing frequently; in fact, on some roads, almost continuously. Traffic is forced to travel in lanes, and, on a two-way road, the outside wheels are near the edge of the pavement. This heavy loading along the edge led to the thickened edge section, which was shown to be the most efficient type by the Pittsburg tests in California and by the Bates road test in Illinois. The thickened edge is now used on all new concrete pavements in California.

Pavements Must be Wider.

Increases in volume of traffic have been accompanied by increases in speed and the old width of fifteen feet, providing only 7½ feet for each line of traffic, has become inadequate and unsafe. Observation and experience demonstrate that ten feet should be allowed for each line of traffic on a two-way road. This is now standard practice on new state highway construction and on reconstruction in California.

The longitudinal center joint has been adopted in California as a means for preventing longitudinal cracking. No attempt has been made to hinge the panels together by dowelling across this center joint. Thickness has been increased to nine inches at edges and along the center joint, reducing to a six-inch thickness two and one-half feet in from the edge and center. In reconstruction, the same section is used with a five-inch minimum thickness over the center of the old pavement.

Increased Strength by Improved Quality.

During the last two years much progress has been made in increasing the strength of the pavement by improving the quality of the concrete. This has been accomplished by more careful and rigid field and laboratory control of the materials and methods used, and by modernizing the design of the mixture. The amount of cement used, six sacks per cubic yard of concrete, has not been increased.

In earlier construction, the compressive strength of concrete at twenty-eight days ranged from 1800 to 2200 pounds. During the present year, the strength has averaged from 3500 to 5000 pounds per square inch on various projects. Cores drilled from pavements in the 1920 study, at ages of one to five years, gave strengths of about 3800 pounds per square inch. Year-old cores, from pavement laid last year, show strengths above 5000 pounds per square inch and average strengths for ninety-day cores, drilled from pavements laid this year, range from 4500 to more than 6000 pounds. This increased strength of concrete is had at little, if any, added cost and gives a substantial additional factor of safety in the pavement.

Reconstruction of Pavements.

Asphaltic concrete is used principally in reconstruction work and its use, in suitable locations, provides an economical means of utilizing the supporting strength of the old pavement. The design of the cross section is worked out in each case to best meet local conditions. In some places, the old pavement has been widened by adding 2½ feet of cement concrete on each side and an asphaltic concrete surface is laid over old base and the new concrete. A more usual practice is to construct new concrete shoulders 2½ feet to 8 feet in width along one or both sides of the old pavement at a grade of two to four inches above the old surface. Asphaltic concrete is then laid between the new shoulders, utilizing the old pavement as base.

Where soil conditions are favorable, the old fifteen-foot pavement has been reconstructed and widened to twenty feet by constructing 2½ feet of asphaltic concrete base on the sides of the old pavement and then by surfacing the full twenty feet of width with an asphaltic concrete wearing surface. So far, there has been no evidence of any tendency for separation along the joint between the old concrete and new asphaltic base.

Improvements in Asphaltic Mix.

An effort is being made to improve the design of asphaltic concrete mixtures to prevent corrugating and displacement under traffic. A reduction in the amount of asphalt used for heavy traffic pavements, below the amount considered necessary ten years ago, has been found highly desirable. The penetration of the asphalt has been reduced to 50° or lower. In the average surface mixture, the asphaltic cement used is generally about 5 per cent to 5.5 per cent or slightly higher. Coincident with a decreased asphalt con-

(Continued on page 12.)

New concrete pavement twenty feet wide with thickened edge and center expansion joint.

A Study of Traffic on California State Highways

By G. R. WINSLOW, Maintenance Engineer.

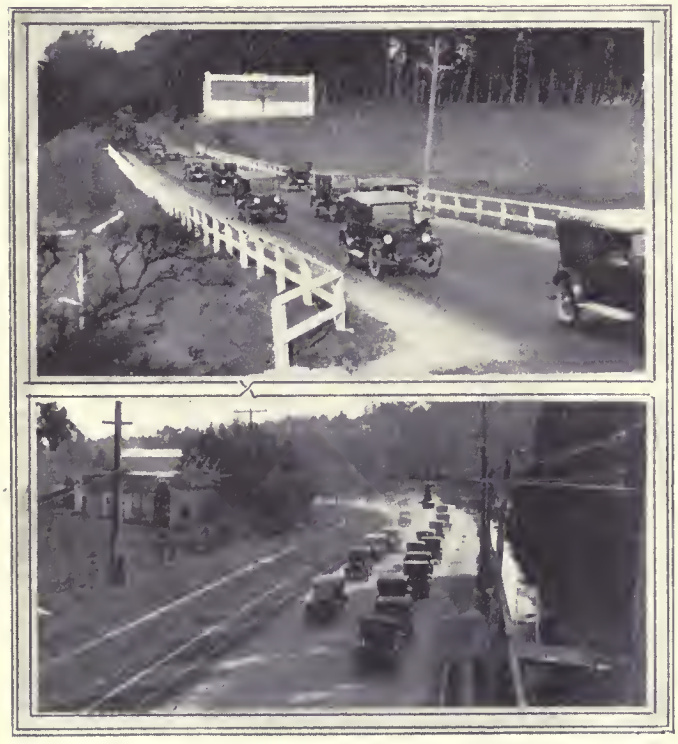
"THOUSANDS tread on thousands' heels." How many of these thousands must be provided for? How many must we design for? How best distribute maintenance funds, that all roads shall be equitably treated? These are problems ever before the road builder.

In the days when traffic was numbered in tens or in hundreds, reliance was placed upon the judgment of the "oldest inhabitant" or other local authority. But traffic has grown and the time has come when guesses must give way to facts. "Heavy" and "light" are but comparative terms and a traffic that seems heavy to one, to another is light. More accurate information is required, hence the traffic count.

In California, even before the days of state highway construction, San Joaquin and Los Angeles counties began to make counts of traffic on improved county roads. At a point in Fresno County, the State Highway Commission has a record of traffic for almost every year from the beginning of its activities. These early records provide much valuable and interesting information, but the data collected are not standardized and are not comparable with the present census.

First General Counts in 1920.

The first general traffic count on California highways was taken in 1920 by the United States Bureau of Public Roads in connection



Moving traffic on the state highway south of San Francisco.

with its investigation of the state highway system. Two years later, the bureau renewed and expanded this census, working in cooperation with the California Highway Commission and several of the counties. Records were taken at 240 representative stations on state highways, over 100 of which were identical with those used two years before, and at 190 places on county roads tributary to state highways. Stations were classed as *intensive* and *extensive*. At intensive stations, the count continued throughout the twenty-four hours of the day, trucks were weighed, tires measured, and drivers questioned. At extensive stations, only the number and types of vehicles were recorded, and observations were limited to daylight hours.

In making the count, vehicles were classified as passenger cars, light and heavy trucks, empty and laden, trailers, busses, and horse-drawn. The census was made a few days at a time at a given station, but the count was not taken simultaneously throughout the state and several months elapsed before the work was completed. (For a more complete description see, "A Report of Traffic on State Highways and County Roads in California, 1922.")

In 1924, the California Highway Commission made a count at about 300 stations on the state system. These stations included practically all on the state highway, used two years before. The count was taken from 6 a.m. to 10 p.m. on the Sunday and Monday nearest the middle of the months of April, June, August, October and December. This count was supplemented by records of ferries, plant quarantine stations, and the Yosemite National Park. The data secured were substantially the same as that taken previously at extensive stations, except that, at some of the typical stations, the December count included a record of the paths of vehicles.

The pavement was divided into one-foot lanes by short painted lines, each third or fifth line being slightly longer to permit of ready recognition. Record was made of the lanes crossed by the left wheel of each passing vehicle during periods of minimum and maximum traffic. The purpose of this observation was to determine the distribution of traffic over the width of the pavement and the extent to which the paths were affected by such factors as road curvature, superelevation, high crown, width of pavement, condition of shoulders, trees and guard rail.

Maintenance Forces Make Counts.

In 1925, a census of traffic was made from July 12th to 18th, inclusive, for sixteen hours daily. A few additional stations were added to those previously used.

Both in 1924 and 1925, the counts were made by the maintenance forces in so far as they could be spared for the work. Records were kept on specially prepared forms so cross-ruled that the horizontal lines represented hours of the day, and the vertical

(Continued at right of map, page 6.)

Vehicles sometimes line up for miles when a traffic jam occurs on the Peninsula Highway.

Read This Twice.

Time is the only wealth which can not be replaced.

Good roads save time and thereby produce wealth.—*Anon.*

Some folks cusses 'bout de cos' o' good roads, but dey learnt *how* to cuss travelin' over *bad* roads!—*Hambone.*

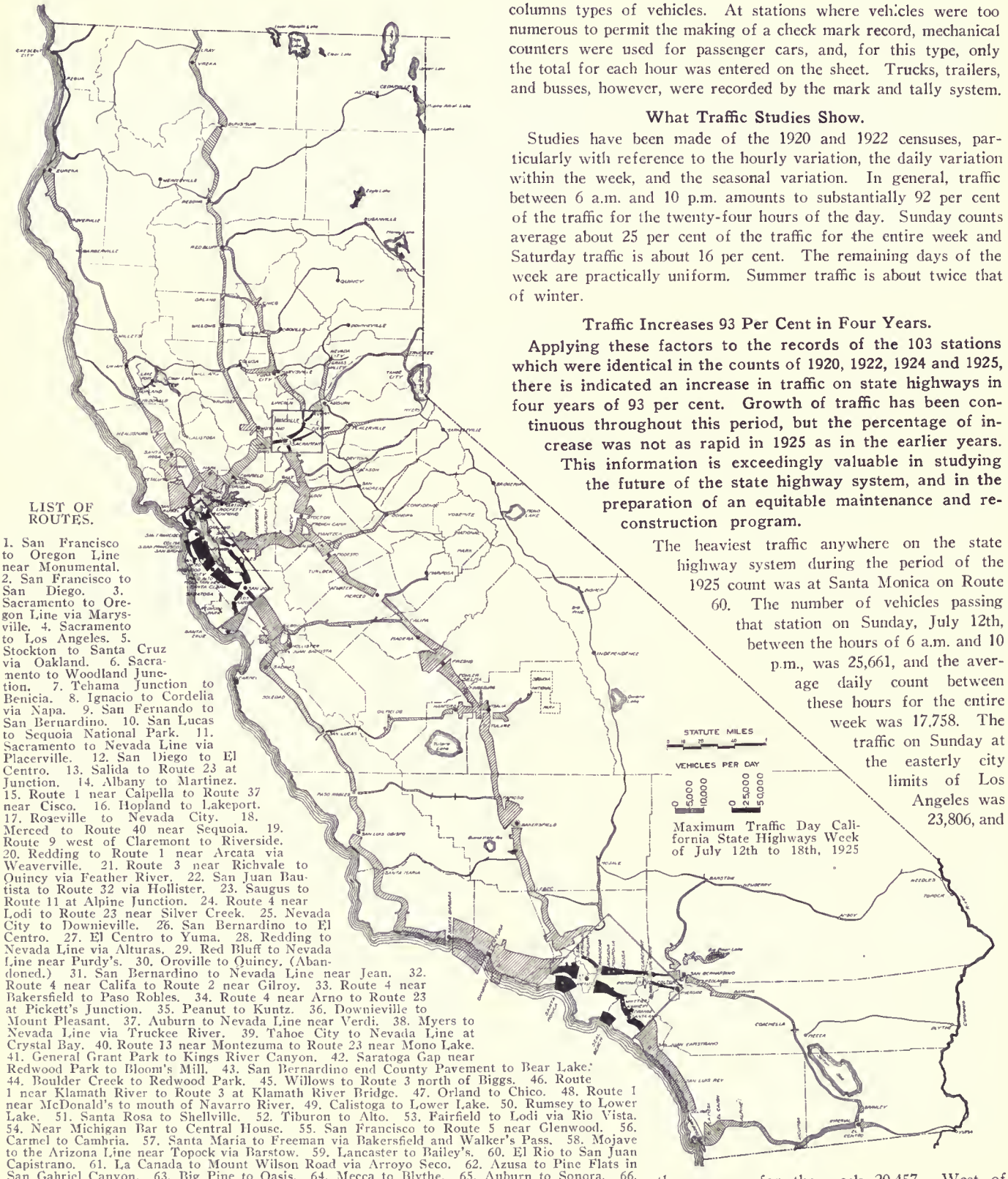
Traffic on the state highway (Whittier Boulevard), Los Angeles County; a fifty-six foot street and one of the heaviest traveled state highways.

California Traffic Census, July 12th to July 18th, 1925, Showing, by Divisions, the Mileage and Average Traffic Density of Each Route in Terms of Vehicles per 16 Hour Day.

*Routes	Div. I		Div. II		Div. III		Div. IV		Div. V		Div. VI		Div. VII		Div. VIII		Div. IX		Div. X		Total	
	Miles	Average density	Miles	Average density	Miles	Average density	Miles	Average density	Miles	Average density	Miles	Average density	Miles	Average density	Miles	Average density	Miles	Average density	Miles	Average density	Miles	Average density
1	335	789					77	3,085													412	1,218
2							69	7,496	273	2,594			170	5,574							512	4,244
3			191	1,503	105	1,721															296	1,580
4											213	2,104	54	1,877					85	2,531	352	2,172
5							98	3,412											21	2,443	119	3,241
6																			15	3,057	15	3,057
7			26	1,070	94	1,419													46	2,137	166	1,563
8							34	1,728											4	2,451	38	1,804
9													44	4,672	19	1,813					63	3,810
10									6	96	104	833									110	793
11					111	866															111	866
12													74	1,488	36	1,059					110	1,348
13																	15	10	117	512	132	455
14							22	3,825													22	3,825
15	22	460			37	874															59	719
18	19	502																			19	502
17					41	1,481															41	1,481
18											56	443							5	300	61	431
19													2	500	19	2,582					21	2,384
20	13	103	69	104																	82	104
21					6	306															6	306
22									15	940											15	940
23													70	942			277	204	17	56	364	339
24																			127	175	127	175
25					35	93															35	93
26															150	743					150	743
27															35	265					35	265
28			65	108																	65	108
29			69	313																	69	313
31															76	483					76	483
32							26	701			57	672									83	681
33									32	425	53	334									85	368
34																			106	168	106	168
35			31	63																	31	63
36					10	10															10	10
37					97	731															97	731
38					55	343															55	343
39					12	484															12	484
40																	14	123	58	310	72	274
41											14	60									14	60
42							20	282													20	282
43															40	422					40	422
44							8	1,142													8	1,142
45					32	359															32	359
46			12	144																	12	144
47					17	427															17	427
48	12	125																			12	125
49							17	440													17	440
51							23	1,284													23	1,284
52							4	785													4	785
53																			57	689	57	689
54																			9	146	9	146
55							21	1,555													21	1,555
57									17	30											17	30
58															165	179					165	179
60													19	11,753							19	11,753
64															92	41					92	41
65					8	227															8	227
66																			4	1,537	4	1,537
67									10	1,544											10	1,544
68							5	4,402													5	4,402
Totals	401	715	463	765	660	946	424	3,207	353	2,096	497	1,240	433	3,822	632	521	306	191	671	875	4,840	1,366

*See next page, left of map, for description of routes.

TRAFFIC DENSITY, MAXIMUM DAY, WEEK OF JULY 12-18, 1925



Maximum Traffic Day California State Highways Week of July 12th to 18th, 1925

LIST OF ROUTES.

1. San Francisco to Oregon Line near Monumental. 2. San Francisco to San Diego. 3. Sacramento to Oregon Line via Marysville. 4. Sacramento to Los Angeles. 5. Stockton to Santa Cruz via Oakland. 6. Sacramento to Woodland Junction. 7. Tehama Junction to Benicia. 8. Ignacio to Cordelia via Napa. 9. San Fernando to San Bernardino. 10. San Lucas to Sequoia National Park. 11. Sacramento to Nevada Line via Placerville. 12. San Diego to El Centro. 13. Salida to Route 23 at Junction. 14. Albany to Martinez. 15. Route 1 near Calpella to Route 37 near Cisco. 16. Hopland to Lakeport. 17. Roseville to Nevada City. 18. Merced to Route 40 near Sequoia. 19. Route 9 west of Claremont to Riverside. 20. Redding to Route 1 near Arcata via Weaverville. 21. Route 3 near Richvale to Quincy via Feather River. 22. San Juan Bautista to Route 32 via Hollister. 23. Saugus to Route 11 at Alpine Junction. 24. Route 4 near Lodi to Route 23 near Silver Creek. 25. Nevada City to Downieville. 26. San Bernardino to El Centro. 27. El Centro to Yuma. 28. Redding to Nevada Line via Alturas. 29. Red Bluff to Nevada Line near Purdy's. 30. Oroville to Quincy. (Abandoned.) 31. San Bernardino to Nevada Line near Jean. 32. Route 4 near Califa to Route 2 near Gilroy. 33. Route 4 near Bakersfield to Paso Robles. 34. Route 4 near Arno to Route 23 at Pickett's Junction. 35. Peanut to Kuntz. 36. Downieville to Mount Pleasant. 37. Auburn to Nevada Line near Verdi. 38. Myers to Nevada Line via Truckee River. 39. Tahoe City to Nevada Line at Crystal Bay. 40. Route 13 near Montezuma to Route 23 near Mono Lake. 41. General Grant Park to Kings River Canyon. 42. Saratoga Gap near Redwood Park to Bloom's Mill. 43. San Bernardino end County Pavement to Bear Lake. 44. Boulder Creek to Redwood Park. 45. Willows to Route 3 north of Biggs. 46. Route 1 near Klamath River to Route 3 at Klamath River Bridge. 47. Orland to Chico. 48. Route 1 near McDonald's to mouth of Navarro River. 49. Calistoga to Lower Lake. 50. Rumsey to Lower Lake. 51. Santa Rosa to Shellville. 52. Tiburon to Alto. 53. Fairfield to Lodi via Rio Vista. 54. Near Michigan Bar to Central House. 55. San Francisco to Route 5 near Glenwood. 56. Carmel to Cambria. 57. Santa Maria to Freeman via Bakersfield and Walker's Pass. 58. Mojave to the Arizona Line near Topock via Barstow. 59. Lancaster to Bailey's. 60. El Rio to San Juan Capistrano. 61. La Canada to Mount Wilson Road via Arroyo Seco. 62. Azusa to Pine Flats in San Gabriel Canyon. 63. Big Pine to Oasis. 64. Mecca to Blythe. 65. Auburn to Sonora. 66. Manteca to Route 5 near Mossdale School. 67. Pajaro River to Route 2 near San Benito River Bridge. 68. San Francisco to San Jose. 69. San Rafael to San Quentin. 70. Ukiah to Mendocino State Hospital. 71. Oregon Line near Chetco to Crescent City.

columns types of vehicles. At stations where vehicles were too numerous to permit the making of a check mark record, mechanical counters were used for passenger cars, and, for this type, only the total for each hour was entered on the sheet. Trucks, trailers, and busses, however, were recorded by the mark and tally system.

What Traffic Studies Show.

Studies have been made of the 1920 and 1922 censuses, particularly with reference to the hourly variation, the daily variation within the week, and the seasonal variation. In general, traffic between 6 a.m. and 10 p.m. amounts to substantially 92 per cent of the traffic for the twenty-four hours of the day. Sunday counts average about 25 per cent of the traffic for the entire week and Saturday traffic is about 16 per cent. The remaining days of the week are practically uniform. Summer traffic is about twice that of winter.

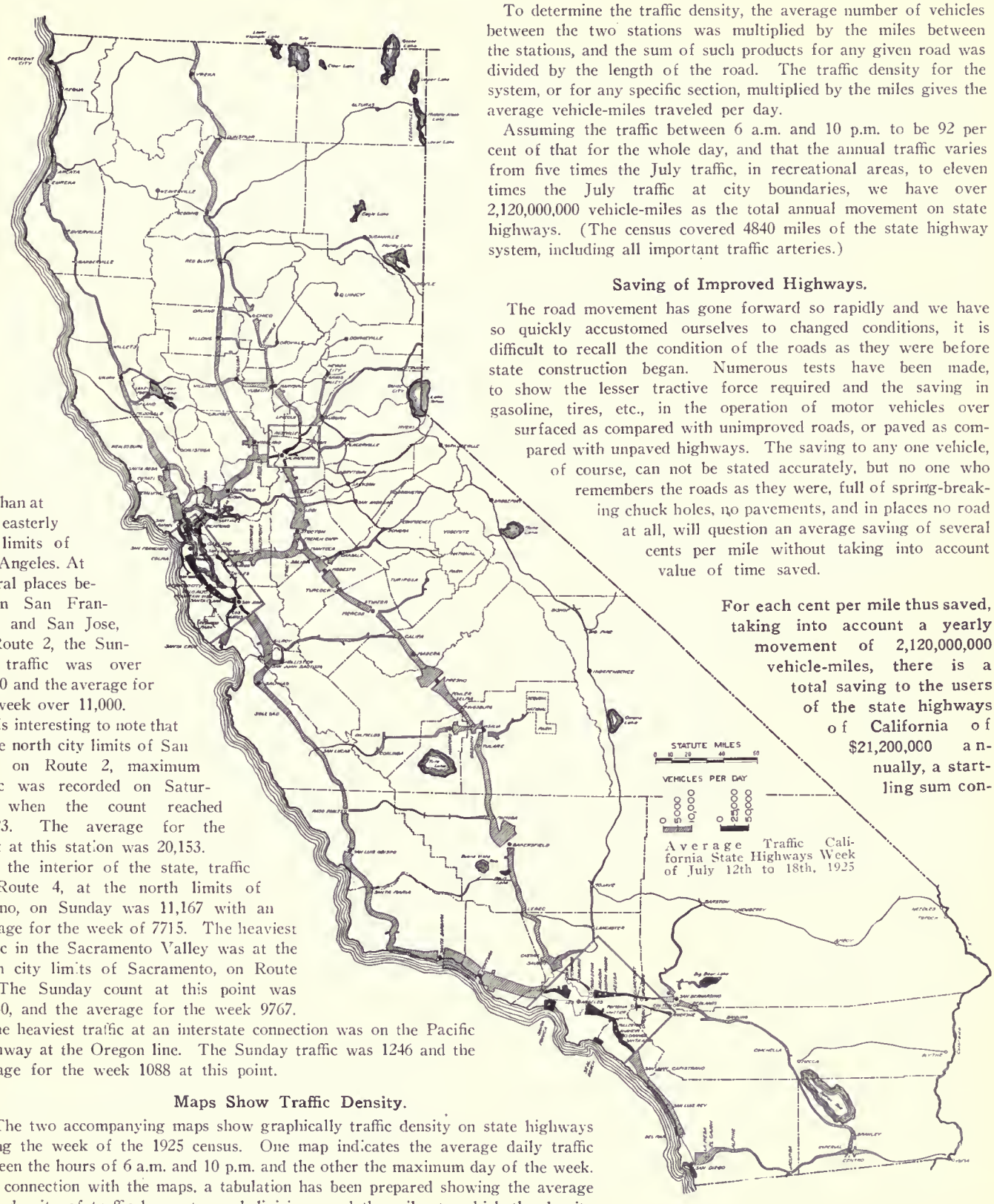
Traffic Increases 93 Per Cent in Four Years.

Applying these factors to the records of the 103 stations which were identical in the counts of 1920, 1922, 1924 and 1925, there is indicated an increase in traffic on state highways in four years of 93 per cent. Growth of traffic has been continuous throughout this period, but the percentage of increase was not as rapid in 1925 as in the earlier years. This information is exceedingly valuable in studying the future of the state highway system, and in the preparation of an equitable maintenance and reconstruction program.

The heaviest traffic anywhere on the state highway system during the period of the 1925 count was at Santa Monica on Route 60. The number of vehicles passing that station on Sunday, July 12th, between the hours of 6 a.m. and 10 p.m., was 25,661, and the average daily count between these hours for the entire week was 17,758. The traffic on Sunday at the easterly city limits of Los Angeles was 23,806, and the average for the week 20,457. West of Hollywood, on Route 2 at its junction with the Lankershim road, the traffic was but slightly

(Continued at left of map, next page.)

AVERAGE TRAFFIC CALIFORNIA HIGHWAYS, 1925 CENSUS



Average Traffic California State Highways Week of July 12th to 18th, 1925

less than at the easterly city limits of Los Angeles. At several places between San Francisco and San Jose, on Route 2, the Sunday traffic was over 22,000 and the average for the week over 11,000.

It is interesting to note that at the north city limits of San Jose, on Route 2, maximum traffic was recorded on Saturday when the count reached 22,623. The average for the week at this station was 20,153.

In the interior of the state, traffic on Route 4, at the north limits of Fresno, on Sunday was 11,167 with an average for the week of 7715. The heaviest traffic in the Sacramento Valley was at the north city limits of Sacramento, on Route 3. The Sunday count at this point was 10,140, and the average for the week 9767.

The heaviest traffic at an interstate connection was on the Pacific Highway at the Oregon line. The Sunday traffic was 1246 and the average for the week 1088 at this point.

Maps Show Traffic Density.

The two accompanying maps show graphically traffic density on state highways during the week of the 1925 census. One map indicates the average daily traffic between the hours of 6 a.m. and 10 p.m. and the other the maximum day of the week.

In connection with the maps, a tabulation has been prepared showing the average daily density of traffic by routes and divisions, and the miles to which the density pertains. In preparing this tabulation, it has been assumed that the increase or decrease in number of vehicles between one station and the next was uniform throughout.

To determine the traffic density, the average number of vehicles between the two stations was multiplied by the miles between the stations, and the sum of such products for any given road was divided by the length of the road. The traffic density for the system, or for any specific section, multiplied by the miles gives the average vehicle-miles traveled per day.

Assuming the traffic between 6 a.m. and 10 p.m. to be 92 per cent of that for the whole day, and that the annual traffic varies from five times the July traffic, in recreational areas, to eleven times the July traffic at city boundaries, we have over 2,120,000,000 vehicle-miles as the total annual movement on state highways. (The census covered 4840 miles of the state highway system, including all important traffic arteries.)

Saving of Improved Highways.

The road movement has gone forward so rapidly and we have so quickly accustomed ourselves to changed conditions, it is difficult to recall the condition of the roads as they were before state construction began. Numerous tests have been made, to show the lesser tractive force required and the saving in gasoline, tires, etc., in the operation of motor vehicles over surfaced as compared with unimproved roads, or paved as compared with unpaved highways. The saving to any one vehicle, of course, can not be stated accurately, but no one who remembers the roads as they were, full of spring-breaking chuck holes, no pavements, and in places no road at all, will question an average saving of several cents per mile without taking into account value of time saved.

For each cent per mile thus saved, taking into account a yearly movement of 2,120,000,000 vehicle-miles, there is a total saving to the users of the state highways of California of $21,200,000 annually, a startling sum considering the state's investment in improved highways to date is only about $100,000,000.

PICTURES CAN ONLY APPROXIMATE BEAUTY OF THE SKYLINE

VIEWS ON THE SKYLINE BOULEVARD DOWN THE SAN FRANCISCO PENINSULA—(1) Bridge across Crystal Spring Dam. (2) Past the Spring Valley lakes. (3) Wide parking places are provided at scenic points. (4) The wide, smooth roadway through a virgin forest. (5) Near the La Honda road. (6) The view toward Half Moon Bay and the Pacific. (7) Construction scene on the recently completed section. (8) The highway in northern San Mateo County. (Photos by A. W. McCurdy.)

NEW SECTION ADDS 12.3 MILES TO SKYLINE BOULEVARD

By A. W. McCurdy, Assistant Division Engineer, San Francisco.

MAKING accessible a district of distinct scenic attractiveness, thirty-three miles of the Skyline boulevard have been graded and surfaced and are now open to travel. Acceptance by the California Highway Commission of the section built under the contract of J. P. Holland has made the La Honda road, in San Mateo County, the present southern terminus of this new state highway down the San Francisco peninsula.

Opening of the La Honda connection has created much interest among residents of San Francisco, San Mateo, Santa Clara, and Santa Cruz counties for the reason that, while incomplete, the boulevard is now available as an alternate route into San Francisco. Congestion on the present Peninsula highway has made additional highways highly desirable.

The completed section of the Skyline route now extends from the intersection of the Great highway and Sloat boulevard, in San Francisco, along the low hills that border Merced Lake, southward into San Mateo County. It passes along the ridge forming the eastern watershed of the Spring Valley lakes, providing a magnificent panorama of ocean and bay, and of the city of San Francisco.

A feature of the location is the spectacular crossing of the massive concrete dam at the outlet of Crystal Lake. A reinforced concrete bridge was built across the crest of this dam, unique in design, because the approaches, in each direction, are the reverse of the arc of the dam. Three sweeping curves were necessary in the bridge in a total length of 608 feet. The width is thirty feet.

Forested Area Attractive.

From the bridge the highway ascends Half Moon Bay hill and from there to the La Honda summit passes through a section of unusual beauty. The natural forestation includes madrone, pine, oak, and magnificent redwood. At an elevation of 2000 feet there is an inspiring view of the ocean to the westward, with beautiful rolling hills in the foreground. To the east, may be seen lower San Francisco Bay and the cities of upper Santa Clara Valley.

Farther south, the highway climbs to a maximum altitude of 2342 feet passing through a heavily timbered area where redwood predominates. It is hard to believe this virgin wilderness, prior to the coming of the road accessible only on foot or horseback, is but twenty-five miles from San Francisco. The boulevard continues through a region of interesting topography which recalls the higher mountains and the Humboldt coast as one beautiful view follows another.

A wider road bed with extra parking space has been provided at points of particular interest.

The Skyline boulevard, designated as Route 55, was added to the state highway system by the bond issue of 1919. Its importance as a possible future traffic outlet for San Francisco was recognized and, in 1922, it was included as a secondary road in the federal aid system. The time undoubtedly will come when it will carry a considerable part of the peninsula traffic.

Four Contracts Completed.

To date, four Skyline contracts, the last of which was extended to provide a connection with a paved cross county road to better serve traffic, have been completed and accepted by the commission, as follows:

P. L. Burr, of San Francisco, grading and surfacing 7.42 miles, forty and thirty feet in width; awarded in January, 1922; accepted in October, 1923; 185,000 cubic yards of excavation; cost $252,000.

P. L. Burr, of San Francisco, grading and surfacing 13.42 miles; width of roadway thirty feet; awarded November, 1922; completed January, 1924; 316,000 yards of excavation; cost $426,000.

J. H. Shepherd, of Stockton, construction of the Crystal Springs Dam bridge; awarded, July, 1923; accepted January, 1924; cost $52,000.

J. P. Holland, of San Francisco, grading and surfacing 6.4 miles; (original contract) awarded March, 1924. Extension 5.94 miles, granted June, 1924; contract accepted November, 1925; total yardage moved 600,000; total cost $541,000.

The total expended on the route to date is approximately $1,300,000. One contract for placing guard rail is now under way.

Modern Machinery Used.

The Holland contract, recently accepted, had many interesting features, not the least of which were the dispatch and efficiency with which the work was conducted. Automotive and steam equipment was used throughout, as high as five power shovels operating at one time. During one period of two weeks, 42,202 cubic yards of material were moved and placed in embankment. The maximum number of men employed was 106, and the thorough organization of the crew was evident at all times.

Joint District Aids Project.

Progress in the building of the Skyline has been materially aided by Joint Highway District No. 1, composed of San Francisco, San Mateo, Santa Clara, and Santa Cruz counties. This district has procured and deeded to the state rights of way and also has borne the expense of necessary fencing.

High standards have been adhered to on all completed sections. Between Sloat boulevard and the La Honda road, there are only four curves with a radius of less than 200 feet, and in most instances much wider curves have been used to permit the longest possible vision of the road ahead. The maximum grade is slightly in excess of 6 per cent; most of it is much less. Near San Francisco the grade has a width of forty feet. The minimum is thirty feet.

The crushed rock surfacing is kept smooth by constant maintenance. A heavy guard rail is being erected at various points along the route for protection of motorists during foggy weather.

The route has been surveyed for its entire length to Woodwardia, a distance of 28.8 miles beyond the La Honda road. Plans have been completed for the section from the La Honda road to Saratoga Gap, 13.9 miles, and are partially completed for the remaining 14.9 miles.

Maintenance Planned.

At Woodwardia, the Skyline connects with the Los Gatos-Santa Cruz state highway and also with the county road to Santa Cruz via Soquel. Traversable sections between La Honda road and Woodwardia will be taken over for maintenance on January 1st.

HIGHWAY LIGHTING DEMONSTRATED.

A demonstration of highway lighting was conducted by the Westinghouse Electric Company on the Peninsula Highway during the recent Western Road Show in San Francisco. With the cooperation of the Pacific Gas and Electric Company, sixteen highway lighting units were placed along the highway in the vicinity of San Bruno.

"Nora, you were entertaining a man in the kitchen last night, were you not?"

"That's for him to say, ma'am. I did my best."—*O. B. Bulletin.*

CONTROL OF CONCRETE—FIELD TESTS AND COMPUTATIONS—CONSTRUCTION DEPARTMENT STANDARDS

By C. S. Pope, Construction Engineer, and C. L. McKesson, Materials and Research Engineer.

PROMPTED by many requests from within and without the State Highway organization, the Construction Department has decided to publish, in the Bulletin, the department's instructions for the control of concrete mixtures. These instructions are known as "Construction Department Standards," and apply only to work coming directly under the department's supervision.

The instructions are included within each pad of the construction department's standards, Form R-16 Revised, Daily Report of Concrete Construction, where they may be readily referred to by engineers on the job.

The instructions are as follows:

1. Read carefully Section 111 of the Manual of Instructions of the Construction Department.

2. The following field testing equipment will be necessary and will be furnished by the Laboratory on requisition:

1 set of 8" Tyler standard sieves of the following mesh sizes: No. 3, No. 10, No. 20, No. 30, No. 40, No. 80, No. 200 and pan.

Plate screens, 16" square, punched with round openings of the following sizes: 2½", 2", 1½", ¾" and ½".

1 quartering canvas, 18" x 24," for sampling rock and sand for sieving.

1 percentage scale weighing to five pounds, Fairbanks-Morse No. 485 recommended.

A 50-foot metallic tape.

A 2-foot rule.

A supply of report forms, R-16, Revised.

Note.—In addition to the equipment listed above, each resident engineer should have one platform scale weighing to 150 pounds or an accurate spring balance having a capacity of at least 50 pounds.

3. The resident engineer should secure or construct quarters adjacent to bins or material storage in which field testing can be carried on and in which equipment will be properly cared for. It should include a work table and shelves or racks upon which equipment can be stored. Some additional equipment which may be obtained locally will be found desirable. This will include a dozen tin bake pans about 10 x 12 inches, a sheet of galvanized iron about 3' x 10', on which aggregates may be dried, a galvanized bucket, and a one cubic-foot measuring box.

Sieve test for sand.

Ascertain source of sand and check up laboratory reports to determine whether sand has been *approved for use*. Secure 25-pound average sample of sand by digging into stock piles at various places. If a sampling tube is used, a smaller sample will be satisfactory. Quarter sample down to about one-fourth and weigh out exactly five pounds. Dry separately in pans or on galvanized iron sheet. Weigh after drying and determine percentage of water in sand.

$$\text{Water content (\%)} = \frac{\text{Wet weight—Dry weight}}{\text{Dry Weight}} \times 100 \quad (1)$$

Add enough dry sand to bring sample up to five pounds and sieve first through a No. 3 sieve, then in succession through finer sieves and record as follows:

Sieve Analysis	Total per cent retained (Cumulative)	Per cent passing (= 100% — Per cent retained)
No. 3 Sieve	----------	----------
No. 10 Sieve	----------	----------
No. 20 Sieve	----------	----------
No. 30 Sieve	----------	---------- (2)
No. 40 Sieve	----------	----------
No. 80 Sieve	----------	----------
No. 200 Sieve	----------	----------

(Five-pound Fairbanks scales No. 485 give percentages passing by direct reading.)

Compare the sieve test results with the grading specifications for fine aggregate, and, if corrections are necessary, promptly notify the contractor in order that same may be made.

Swell of sand due to moisture content.

Measure exactly one cubic foot of sand from stock piles without drying, dumping sand loosely in measuring box from a shovel held just above the edge of the box. Before moving the box, strike off with a straightedge. Weigh wet sand. Dry this sand on galvanized iron sheet and weigh carefully. Replace sand in measuring box loosely as above described. Add enough sand which has been dried separately to fill measuring box and strike. Weigh sand in box. Per cent swell of sand due to moisture will be calculated as follows:

(a) Weight of cubic foot moist sand (as received)--------
(b) Weight of same sand after drying --------
(c) Weight of one cubic foot dry sand --------

Referring to weights by reference characters: % Swell of sand due to moisture $= \frac{c-b}{c} \times 100.$ (3)

Caution—After filling measuring box with loose sand, any movement of the box or jarring will lower surface of sand. *Do not refill* before weighing.

Sieve analysis of coarse aggregate.

In order to insure uniformity in concrete, it is usually specified that coarse aggregate shall be furnished in two sizes to be kept in separate stock piles. In such cases, both sizes of aggregate shall be sampled and sieve analyses made as described for sand except that much larger samples shall be tested. One hundred pound samples should be tested when possible, and twenty-five pounds shall be the minimum size of coarse aggregate samples.

After making sieve analysis of both sizes of coarse aggregate, determine the proportionate quantities which will most nearly give the combined grading specified for coarse aggregate. Make a combined sample, 300 to 500 pounds, in the proportions believed to be correct. Mix thoroughly and quarter down to one cubic foot. Then make moisture and void determinations of the combined sample as hereinafter described and after this, a screen analysis on the same combined coarse aggregate sample.

Coarse aggregate segregates readily in handling, and when it is supplied in one size, great care should be taken to see that every sample screened is typical of the material to be used.

Combined Mixture.

The combined mixture should be computed from the fine and coarse aggregate sievings. The data noted in the combined mix column shall be the typical mix run during the day. Sieve results need not be tabulated closer than one-half per cent.

Moisture content of coarse aggregate.

Determine as for sand except that this determination is best made on a large sample, 25 to 100 pounds.

Information regarding moisture content in the sand and coarse aggregate should be sent immediately to the assistant at mixer in order that the water per batch may be adjusted accordingly.

Void determinations.

The purpose of screen analysis is primarily to determine whether material conforms to a predetermined grading which is known to be associated with a low percentage of voids. The yield of concrete is largely dependent upon percentage of voids in aggregate, therefore voids shall be determined in the field.

To make this test, it is necessary that you know the specific gravity of the material. This will be shown on the material test report, but in case your record does not show it, wire or write the laboratory for the information. With specific gravity of aggregate known, proceed as follows:

(e)=Weight of one cubic foot loose measure of dry sand or coarse aggregate.

(f)=62.4 X specific gravity of material.
Apparent volume is volume measured dry and loose.

$$\text{Absolute volume} = \frac{e}{f} \times \text{apparent volume.} \qquad (4)$$

$$\text{Voids} = \text{apparent volume—absolute volume.} \qquad (5)$$

$$\%\ \text{Voids} = \frac{\text{Voids in cubic feet}}{\text{Apparent volume in cubic feet}} \times 100 \qquad (6)$$

Design of concrete mixtures.

The more important considerations entering into the design of concrete mixtures are:

Workability	Uniformity
Strength	Economical use of Cement
Density	

In our specifications the amount of cement for Class "A" concrete is fixed at six sacks per cubic yard. In order to secure maximum strength, density and reasonable workability, the grading of coarse and fine aggregate should be that which, within specification limits, will give the lowest percentages of voids.

The amount of fine aggregate should be kept at the minimum which will provide sufficient mortar to fill all voids in coarse aggregate and which will provide the small surplus necessary for finishing. With ordinary coarse aggregate, the amount of sand required will be about 20 per cent more than enough to fill the voids in the coarse aggregate.

Concrete consists of cement, sand and rock particles with voids or interstices between the particles filled with water or air.

This may be expressed in the following formula:

$$\text{Volume of concrete} = C+S+R+V \text{ and} \qquad (7)$$
$$\text{Volume of concrete} — V = C+S+R \qquad (8)$$

In this formula, V is the space occupied by water and air, usually referred to as "voids." C is the "*absolute volume*" of cement the voids all being included in V. S and R refer, respectively, to *absolute volumes* of sand and rock. This formula for *absolute volumes* has been mathematically derived from a consideration of *apparent volumes* or volumes as they appear when measured, and may be accepted as correct.

Yield of concrete.

The combined volume C+S+R in Formula (8) has been found by experience to be about .82 of the volume of the concrete. This factor may vary slightly with the *complaisance* of materials which is their faculty of fitting together in a dense mass. In general, it may be accepted as covering average laboratory conditions. For convenience, this ratio of the combined value of C+S+R to the volume of concrete has been termed the "coefficient" of yield and may be expressed as follows:

$$\text{"Coeff."} = \frac{C+S+R}{\text{Vol. of Conc.}} \qquad (9)$$

and by transposing, we have the "yield," or volume, of concrete as follows:

$$\text{Volume of concrete} = \frac{C+S+R}{\text{Coeff.}} \qquad (10)$$

In field work there are losses due to low subgrade, spreading forms, etc., and from experience, it has been found that the following values should be assumed:

For concrete paving Coeff. = .88
Concrete in forms Coeff. = .85

These values may require slight adjustment from time to time due to difference in *complaisance* or other conditions. The yield should be checked carefully and adjustments made when necessary to keep the yield at exactly one cubic yard for each six sacks of cement.

Cement usually contains slightly less than 55 per cent voids, but for convenience the voids may be assumed to be 55 per cent. Voids in sand and coarse aggregate are to be determined as above. Following is an example of method of calculating yield:

Assumed mixture.

	Cu. ft. absolute volume
1 cubic foot (apparent volume) cement =	0.45
1.73 cubic feet (apparent volume) sand (voids 34%) = 1.73 X .66 =	1.14
3.82 cubic feet (apparent volume) coarse aggregate (voids 38%) = 3.82 X .62 =	2.37
Total absolute volume	3.96

$$\text{Cubic feet concrete per sack of cement} = \frac{3.96}{.88} = 4.50$$

Yield for six sacks = 4.50 X 6 = 27.00 cubic feet

These apparent volumes are *dry loose* measure. If material is measured wet, allowance in measuring must be made for swell.

In measuring batch boxes to set a mix, measure the sand as it comes from stock pile, but always correct for swell due to moisture content and in reports give cubic feet of both dry and wet material.

The following table gives yield of concrete with various percentages of voids in aggregate. The coefficient .88 is sufficiently high to provide concrete to fill irregularities in carefully constructed subgrade which has been struck to *full* depth with a template.

Where concrete is placed in forms and no extra volume need be provided for, the coefficient .88 may be reduced to .85.

After the mix is set in this manner, a careful check of cement and of the actual yield may sometimes require slight readjustment of the mix. Variations in voids in either sand or gravel will be immediately reflected by increasing or diminishing the yield of concrete.

Void determinations shall be made daily or more often if material shows variation.

CONCRETE PROPORTIONS.

Six sacks per cubic yard.

Sand* Voids	Rock Voids. 35%	36%	37%	38%	39%
32	1-1.56-3.77	1-1.59-3.80	1-1.63-3.81	1-1.72-3.77	1-1.78-3.77
33	1-1.57-3.78	1-1.60-3.81	1-1.63-3.82	1-1.69-3.84	1-1.76-3.79
34	1-1.61-3.77	1-1.64-3.80	1-1.68-3.81	1-1.73-3.82	1-1.77-3.84
35	1-1.63-3.77	1-1.64-3.80	1-1.69-3.82	1-1.75-3.83	1-1.80-3.84
36	1-1.63-3.80	1-1.67-3.81	1-1.72-3.83	1-1.78-3.84	1-1.81-3.85
37	1-1.65-3.80	1-1.68-3.83	1-1.71-3.86	1-1.78-3.86	1-1.82-3.87
38	1-1.68-3.80	1-1.71-3.83	1-1.74-3.86	1-1.79-3.87	1-1.84-3.89
39	1-1.69-3.82	1-1.74-3.83	1-1.79-3.84	1-1.80-3.86	1-1.85-3.90
40	1-1.70-3.83	1-1.75-3.85	1-1.80-3.86	1-1.83-3.86	1-1.88-3.90
	40%	41%	42%	43%	44%
32	1-1.82-3.78	1-1.87-3.80	1-1.90-3.80	1-1.94-3.84	1-1.97-3.88
33	1-1.82-3.82	1-1.87-3.83	1-1.91-3.84	1-1.94-3.88	1-1.97-3.91
34	1-1.83-3.83	1-1.88-3.85	1-1.92-3.86	1-1.96-3.90	1-1.98-3.93
35	1-1.84-3.85	1-1.88-3.88	1-1.89-3.93	1-1.92-3.96	1-1.98-3.97
36	1-1.86-3.87	1-1.91-3.88	1-1.95-3.90	1-1.97-3.95	1-2-3.98
37	1-1.87-3.89	1-1.94-3.88	1-1.97-3.92	1-1.98-3.97	1-2-4
38	1-1.89-3.90	1-1.95-3.90	1-1.98-3.93	1-2-3.98	1-2-4
39	1-1.90-3.92	1-1.95-3.93	1-1.98-3.97	1-2-4	1-2-4
40	1-1.92-3.93	1-1.95-3.97	1-2-3.98	1-2-4	1-2-4

*Voids in loose material.

The foregoing instructions are based on a few simple, common sense rules, the correctness of which has been proved in actual practice. Since their adoption as a standard, the average strength of the state's concrete pavements has been increased from approximately 2500 pounds per square inch, at 28 days, to about 4000 pounds per square inch. In practical effect, if computed according to Older's Corner Break Formula, this is equivalent to thickening the edge of the pavement about 26 per cent without adding any material or incurring additional expense.

The Construction Department, therefore, has ample reason to believe that the system of control installed under its direction is a success, and that the new concrete pavements on California state highways, as a whole, will compare favorably with similar work elsewhere.

NOVEL PLAN FOR CHECKING SLOPES.

BECAUSE of the many and various materials encountered in excavation, and a limited width of right of way on the new Coast Highway through the Malibu Ranch, it has been necessary to employ numerous slope angles for cut banks, ranging from ¾ to 1, to 1½ to 1, reports Division VII.

In checking the various slopes, a 5-foot straightedge is employed with cleats attached at the proper angle. They are arranged in such a way that when a cleat is held horizontal as shown by an attached level, the straightedge is on the proper slope.

The straightedge is provided with six cleats on each side and can be used to measure the angle of twelve different slopes.

WHAT THE DIVISIONS ARE DOING

DIVISION I.

HEADQUARTERS, WILLITS.

T. A. BEDFORD, DIVISION ENGINEER.

Counties of Del Norte, Humboldt, Mendocino, and Lake.

WHILE not in charge of the work, Division I is directly affected by the opening of the Forest highway over Oregon Mountain on the Grants Pass-Crescent City connection. Steam shovels "broke through" during November and recently the highway was opened to traffic by the Bureau of Public Roads. The narrow and dangerous county road is now eliminated, facilitating traffic over the Oregon section of the Redwood Highway.

The San Quentin Prison Camp working in the Smith River canyon has about completed the grading eastward to Adams Station, the beginning of the Forest highway contract. Clearing and trail gangs already have started work west of Myrtle Creek, in the direction of Crescent City. This will be the next section to be built by this camp.

Improve Maintenance Station.

Improvement of the new maintenance station at Fortuna has been begun with the building of a truck shed and erection of fencing. Protection of equipment used in the vicinity during rainy weather is imperative. Foreman H. L. Harmon is in charge of this section.

The Butterfield-Sears Company, contractors on the widening and straightening project at Leggett Valley, fifty miles north of Willits, on the Redwood Highway, have practically completed their six-mile project and are moving out the equipment which has been in service there. One power shovel is being held to remove slides during the winter and to prepare for surfacing operations next spring.

DIVISION II.

HEADQUARTERS, REDDING.

H. S. COMLY, DIVISION ENGINEER.

Counties of Siskiyou, Modoc, Trinity, Shasta, Lassen, Tehama, and northern Plumas.

COMPLETING a continuous pavement down the west side of the Sacramento Valley from Red Bluff to Davis, the new state highway through the town of Corning has been finished and opened to traffic. Through the business section of the city the street is paved for its full width, and for the remainder of the 1.5 miles, twenty feet wide. It is of the cement concrete type. The state and the municipality of Corning cooperated in financing the project. Polk and Polk of Chico were the contractors.

DIVISION III.

HEADQUARTERS, SACRAMENTO.

F. W. HASELWOOD, ACTING DIVISION ENGINEER.

Counties of Butte, Colusa, El Dorado, Glenn, Nevada, Placer, southern Plumas, Sierra, Sutter, Yuba, and northern Sacramento and Yolo.

ON DECEMBER 15th, traffic began passing over the new pavement between the American River bridge and North Sacramento, placing in use the new subways and eliminating two grade crossings. This section has the heaviest travel of any in Division III. The new pavement is of cement concrete, thirty feet in width and seven inches thick. Minor details will require about thirty days for completion.

A new power shovel shortly will be added to the equipment of the Nevada Contracting Company, contractors on the grading project between Floriston and the Nevada line. Progress to date has been slow due to breakdown of equipment and bad weather.

The Irey and Holden contract for 5.8 miles of grading and surfacing east of Placerville on the Lake Tahoe route is scheduled for completion early in January. The work has been finished with the exception of a rocky cut 1000 feet in length.

Driving of piles for the construction of three timber trestles bridges on lateral roads east of Willows and west of Chico has been completed. Opening of the bridges will greatly facilitate winter travel.

Maintenance Importance Increases.

The first foreman's cottage to be erected in Division III will be located on the recently acquired maintenance station site in Marysville. It will be occupied by Foreman J. E. Stevens who will be moved from Wheatland. The Marysville yard soon will be an important station when additional state routes are taken over for maintenance on January 1st.

A storage shed for equipment is being erected at the Arbuckle maintenance station on the west side highway.

Improvements authorized for the new station at Colfax, Placer County, include a storage shed 30 x 100 feet; sleeping quarters for eight men, kitchen-dining room, and living room.

Surveys have been made for the extension of the state highway through the town of Truckee via Birkhalter street.

Prior to the closing of the road by snow, Bishop and Brooks completed their surfacing contract between Tahoe City and the Nevada line, 11.6 miles along the north shore of Lake Tahoe. Slowly the highway about the lake is being improved on up-to-date standards.

The new storage shed at Truckee has been completed and all equipment safely housed for the winter. The building on the new maintenance site is 30 by 80 feet.

DIVISION IV.

HEADQUARTERS, SAN FRANCISCO.

JOHN H. SKEGGS, DIVISION ENGINEER.

Counties of San Francisco, Marin, Sonoma, Napa, Contra Costa, Alameda, Santa Clara, Santa Cruz, and San Mateo.

PLACING of cement concrete shoulders on either side of the existing pavement on the Peninsula highway has been completed by the Federal Paving Company, and placing of quarry waste rock shoulders to widen the roadway to fifty feet is now in progress. Culverts also are being extended. Inclement weather

(Continued on next page.)

PAVEMENT STRENGTH INCREASED

(Continued from page 3.)

tent it has been found feasible to increase the amount of very fine stone dust in the mixture apparently with beneficial results.

Experiments have demonstrated that the slipperiness of asphaltic concrete pavements is reduced by the omission of the flush coat and this has been omitted on asphalt pavements laid during the last two seasons.

DIVISION REPORTS

(Continued from page 12.)

has delayed resurfacing of the old pavement between the new shoulders, which will be done with asphalt concrete.

Widening Achieved.

The widening work accomplished in Contra Costa County, on the trunk highway leading to the site of the new Carquinez Straits bridge, is attracting much attention as the project nears completion. The old fifteen-foot concrete pavement has been widened to thirty feet with asphalt macadam shoulders and similar surfacing has been applied to the old pavement where necessary.

Alignment has been improved and the flow of traffic over this section facilitated. Vertical curves on a 6 per cent grade have been lengthened from 200 feet to 600 feet, greatly improving sight distance.

Considering the cost of the work, it may be considered an outstanding achievement in highway widening.

Considerable oiling of shoulders, ditching, and grading work remains to be done, but practically all of the new roadway is open to traffic.

Overflow of adjacent lands due to extreme high tides along the Bayshore highway has been averted by the early completion of bridges and tide gates. Contractor D. A. Foley is rapidly finishing the project.

New Guard Rail on Skyline.

The new guard rail which is being erected at various places along the Skyline boulevard by S. A. Martindale is already noticeable. This improvement will define the limits of the traveled roadway during heavy fogs and at night.

Use of detour roads has been eliminated on the Redwood highway between Santa Rosa and Healdsburg, where Contractor J. V. Galbraith is completing the last mile of the second half of the twenty-foot "second-story" concrete pavement. Traffic is now being handled on the half of the pavement first completed. This important reconstruction project is now scheduled for early completion.

DIVISION VI.

HEADQUARTERS, FRESNO.

J. B. WOODSON, DIVISION ENGINEER.

Counties of Fresno, Madera, Merced, Mariposa, Kings, Tulare, and Kern, north of the Tehachapi.

APPROXIMATELY 400 prisoners and five power shovels are now rushing the Merced Canyon project connecting with the Yosemite National Park, and opening of the highway to traffic early next summer is assured. Moving of the Folsom camp from the Kern River Canyon east of Bakersfield to its new location near El Portal was completed during the month under the direction of Superintendent Ralph W. Brown.

Widening of the state highway between Buhach and the Merced River has been completed by Contractor H. H. Peterson, who has moved his equipment and crew to Ventura, where he will begin a similar contract in Division VII.

The Warren Construction Company is surfacing with asphalt a section of the trunk highway through the town of Delano, Kern County.

Stewart and Bland, Fresno contractors, have a power shovel at work on the Sequoia Park entrance improving the alignment in anticipation of heavy traffic over this road next summer.

With the exception of the convict jobs, all of the work under way in the division is classed as reconstruction.

DIVISION VII.

HEADQUARTERS, LOS ANGELES.

S. V. CORTELYOU, DIVISION ENGINEER.

Counties of Los Angeles, Ventura, Orange, San Diego, and eastern Kern, south of Mojave.

WITH the completion of 5.6 miles of "second-story" concrete pavement between San Juan and Galivan, all of the old fifteen-foot pavement in Orange County has been eliminated. The new twenty-foot pavement with rock borders is a great improvement over the old highway.

Reconstruction work is progressing rapidly on the Whittier boulevard and the new pavement is now open to traffic from Montebello to the Workman Mills road. Placing of concrete on the Philadelphia street extension, near Whittier, is under way.

Line Change Nearly Ready.

Placing of pavement on the San Onofre-San Mateo Creek line change has been completed and the rock surfacing of the long fill at the approach to the San Mateo Creek bridge is now under way. When open to traffic the new section will eliminate nearly a mile of distance and many curves, where numerous fatal accidents have occurred.

Two power shovels are now at work improving the alignment of the Mountain Springs grade east of San Diego, in San Diego and Imperial counties. Traffic is being handled over this section without difficulty.

The fill which will replace the old timber structure is nearing completion on the "Middle Causeway" on the Coast route, in Ventura County. Drainage structures included in the contract already have been finished.

Grading has been started at the southerly end of the Laguna-Serra project on the South Coast highway in Orange County and has progressed as far as Salt Creek, where it was found necessary to drive piles for the foundation of a twelve-foot arch culvert.

DIVISION IX.

HEADQUARTERS, BISHOP.

F G. SOMNER, DIVISION ENGINEER.

Counties of Inyo, Mono, and eastern Kern County, north of Mojave.

THE surfacing of 7.5 miles between the Devil's Punch Bowl and Rush Creek, in Mono County, has been completed and a greatly improved highway is the result. George A. Clarge was the contractor.

Contractor Harry Wilson already is at work on the grading of 36.7 miles of the east of the Sierra trunk highway in Inyo and Kern counties. Rapid progress is reported on this contract which was recently awarded by the commission.

A forty-foot roadway is being graded between Mojave and the San Bernardino County line, a distance of 31.5 miles, by Supervisor J. I. Wagy of Kern County. The improvement is being made on the state survey. The new road will be taken over for maintenance on January 1st.

DIVISION X.

HEADQUARTERS, SACRAMENTO.

J. C. McLEOD, DIVISION ENGINEER.

Counties of Amador, Calaveras, Alpine, Tuolumne, Stanislaus, San Joaquin, Solano, and southern Sacramento and Yolo counties.

DIVISION X is gratified to announce that the state's part of the improvement of the southern entrance to Sacramento, on the Stockton boulevard, has been completed and opened to traffic.

(Continued on next page.)

DIVISION REPORTS

(Continued from page 13.)

In cooperation with the Central California Traction Company, a thirty-three foot pavement has been placed for a distance of one-half mile. A. Wallace was resident engineer.

The extension of the J. F. Knapp contract for the pavement of 2800 additional lineal feet through the town of Manteca, San Joaquin County, has been completed and good progress is being made by the city on its part of the project for the paving of the street full width. The state paved a twenty-foot strip in the center of the street.

Amador County Cooperates.

R. N. Murdoch has completed the grading of the Central House-Drytown section of the state highway, in Amador County, and the county is now surfacing the roadway with crushed rock.

Additional culverts have been placed on the Michigan Bar-Drytown section and also on the state highway between Ione and Jackson, in Amador County. The maintenance department expects to thus eliminate future drainage troubles.

Improvements have been authorized on the Stephens Bar bridge on the Big Oak Flat road in Tuolumne County.

AN ODE TO THE TESTING ENGINEER

There is one guy around in whom vices abound
Who turns all of our joy into ashes.
He sits in his den with a virulent pen
But instead of cuss words, he'll use dashes.
We send in our dope with a prayer and a hope
And make out the forms with precision;
Then meekly we wait till some far distant date
For this bird to hand out a decision.
We chop out a sheet of asphaltic concrete
That will last while the mountains abide
And he yells "It's too light and the dust isn't right"
For he revels in Tetrachloride.
We put down a street of enduring concrete
And as soon as its beauty he sees
With a calyx core drill he knocks holes in it till
It looks like an aged Swiss cheese.
And he ain't any saint when we send in some paint
With which we smear guard rails each season.
"Saponification!" He cries with elation
You're shy of zinc oxide and resin.
But some day I'll go out with some concrete so stout
It'll make all his henchmen look silly
That his doggoned old jack won't be able to crack,
Then I'll lie down and call for a lily.—With apologies from
W. K. Wright.

FESTIVITIES OPEN KERN HIGHWAY

UNDER the direction of Bakersfield civic organizations, the new Kern River Canyon highway, connecting Bakersfield and Democrat Springs, Division VI, was dedicated and opened to traffic on December 20th. The 7.5 miles at the eastern end of this project were completed with convict labor. Previously, approximately 7.5 miles were built under contract, and 10 miles, immediately east of Bakersfield, were graded by the county, which also has improved a 17-mile section east of Democrat Springs. The entire highway, including the Walker Pass section, will come under state maintenance on January 1st.

State expenditures to date on this route have totaled about $1,000,000. The highway, known as the Walker Pass route, was added to the state system by the 1919 bond issue.

Rastus: "Boy, it was so cold whar I cum frum we used to frow water out de window and slide down on the icicle."

Mose: "You all talk nuff'ns. Whar I lib, it's so cold we gotter build fiahs under de cows to keep em fum givin' ice cream."

BRIDGE MANUAL COMMENDED

A NUMBER of letters have been received at headquarters commending the bridge department manual, which was recently issued in printed form for use of engineers in the field. The bridge department was particularly pleased with the letter which follows from one of the largest engineering firms in the country:

HARRINGTON, HOWARD AND ASH,
Consulting Engineers,
Kansas City, Mo.

California Highway Commission,
Bridge Department,
Sacramento, Calif.

Attention Mr. Harlan D. Miller.

Dear Mr. Miller:

We are just in receipt of your Manual of Instructions of the Bridge Department, California Highway Commission. Although I have been able to look it over only hastily, I am much impressed by its merit and wish to offer you my congratulations on its production. Such manuals certainly represent steps forward in the engineering profession. I am very grateful to you for sending us this copy, and remain

Very sincerely yours,

HARRINGTON, HOWARD AND ASH,
By (Signed) E. E. HOWARD.

UNDER PASS AUTHORIZED

THE CONSTRUCTION of an under pass under the tracks of the Southern Pacific railroad on the Bay Shore highway at South San Francisco has been authorized by the State Railroad Commission. The division of cost included in the commission's order is as follows:

State of California, 57.5 per cent; South San Francisco belt railroad, 4.5 per cent; Southern Pacific Company, 38 per cent.

The Southern Pacific Company has filed a petition for a rehearing of the commission's decision, protesting the percentage of cost of the grade separation to be borne by that company.

NOT A GOOD PREMISE

(Los Angeles Daily News.)

TAKING the wind out of our winding state highways is objected to by the California Outdoor Art League on the grounds that it will be a destruction of the picturesque in scenery.

Every sympathy and aid should be extended to any group of people engaged in defending the crude and crass attempts of modern materialism to destroy natural beauty. But this move we find to be inadvisable, especially in that the straightening of state roads will probably not bring disenchantment to any appreciable degree. Too many curves are death curves, where lives of whole families are sometimes snuffed out. And, too, the straight line has its beauty in which the driver of the car can share, which is something he can not do when he must continually negotiate hairpin turns.

A maintenance superintendent in Division IV tells a story of a woman walking on some newly constructed shoulders. Two automobiles were approaching and as they passed Mrs. X, one had to swing over on the shoulder, a little. She addressed the driver in a rather loud tone of voice:

"What's the big idea of driving on the sidewalk—this was made to walk on."

The superintendent couldn't help laughing at the thought the shoulders were put there only for pedestrians.

Do You Know One?

Any girl can be gay in a nice coupe;
In a taxi they all can be jolly;
But the girl worth while is the girl who can smile
When you're taking her home in a trolley.

WELL IN THE SAND HILLS—Prospecting for water in the very midst of the Imperial County Sand Hills, Division VIII secured a flow of 500 gallons per minute. The water will be available for use of contractors during paving operations, bids for which are pending. The well is the only water in miles.

BRIDGE DEPARTMENT NEWS

WORK is progressing on the construction of an under-grade crossing having a 30-foot roadway and a 5-foot sidewalk, under the Sacramento Northern tracks near West Sacramento in Yolo County. The plans call for a 35-foot steel girder beam and concrete deck span on concrete abutments. C. M. Butts is resident engineer.

Construction of a reinforced concrete bridge across Merced River near El Portal has been begun. The completed structure will consist of three 58-foot reinforced concrete spans on concrete piers and abutments. The roadway will be 24 feet wide and a 4-foot sidewalk will be built on either side. H. Carter is resident engineer.

New men recently added to the Bridge Department staff are: Samuel Potashnick, A. V. Alder, W. B. Anderson, W. J. Christy, J. H. Horn, O. R. Westlund, J. J. White, Wm. T. Haight, T. E. Ferneau, and M. A. Clark, who was transferred from Division VII.

The two subways in North Sacramento have been completed except for minor finishing. The new roadway was opened to traffic December 15th.

Scenic Arch Progressing.

The work on the Charley Creek Bridge, in the Sacramento Canyon, is progressing rapidly. The north approach spans are completed and the arch ring poured. This structure is the highest combination arch and girder bridge ever constructed by the commission. W. H. Johnson is resident engineer.

Work has been completed on the Ventura River bridge extension, on the Coast Route and on the Boulder Creek structures on the California Redwood Park Highway.

SECONDARY ROADS BIBLIOGRAPHY.

The Engineering Societies Library announces the preparation of a bibliography (S. 4085) of books and articles on earth and gravel roads, published between January, 1920, and June, 1925.

The list contains 140 references with brief annotations. Mimeographed copies may be obtained for $1.50 each by writing to the Engineering Societies Library, 29 West 39th street, New York.

Waited Too Long.

"Good heavens! Who gave you the black eye?"
"A bridegroom—for kissing the bride after the ceremony."
"But surely he didn't object to that ancient custom?"
"No—but it was two years after the ceremony."

HIGHWAY NEWS NOTES

W. K. WRIGHT, assistant division engineer in charge of construction, Division X, Sacramento, has been transferred to Division VI at Fresno where he will succeed S. T. Corfield as assistant division engineer. Mr. Corfield is resigning to become construction superintendent for a well known California contractor. He was presented with a handsome gold watch by the employees of the Fresno office.

All headquarters was interested in the announcement of the arrival of Miss Madylon Joyce Barrett, whose mother is Mrs. Fay Barrett, former popular stenographer of the headquarters office.

Division X has received several interesting letters from Miss Ruth Miles, who is accompanying her parents on a tour of the British Isles.

C. E. O'Connell, Chief Clerk at Bishop, formerly of headquarters, modestly announces the arrival of his first son, Comte Edward, Jr., now nearly a month old.

Veteran Engineer Passes.

Division IV announces the passing of L. C. Winkelman, Jr., one of the veteran employees of that division. Mr. Winkelman entered the services of the California Highway Commission as instrument man in 1912. He has held various positions and for four years prior to his death was resident engineer. His last work was in connection with the construction of the Bayshore Highway. The deceased is survived by a widow and four-year-old daughter. A beautiful floral tribute was presented by the employees of the division.

W. H. Irish, assistant resident engineer, has been transferred from Division III to Division V as chief of party.

H. B. LaForge is another Division III man who has been transferred. He is now with Division IV and is located on the Peninsula Highway paving contract.

Long Job Completed.

J. L. Piper, resident engineer who has been located at Colfax for the last two and one-half years has completed his assignment and is temporarily in the Division III office.

R. M. Haverstick, chief of party, Division VII, is the proud father of an eight-pound daughter.

Division VII News.

C. P. McAndrew, assistant resident engineer, has been transferred from the Malibu ranch grading contract to the Foothill Boulevard widening job near San Fernando.

R. D. Kinsey is acting resident engineer on the Middle Causeway contract on the Coast Highway north of Ventura.

Theodore Usher, rodman of Division VI, has resigned to enter the services of the Merced Irrigation District.

H. O. Ragan, resident engineer, Bakersfield, Division VI, has been transferred to Division VIII, San Bernardino.

George L. Lisher, assistant resident engineer, Merced, Division VI, has been transferred to Division V, San Luis Obispo.

C. H. Quinn and J. S. Langenbach have resigned from Division X to do survey work for the Southern Pacific Company.

Division X Foreman Dies.

Richard Bennan, for years in charge of state highway maintenance work at San Andreas, Division X, passed away recently at the El Dorado Hospital, Stockton. The division regrets, exceedingly, the loss of an able and dependable foreman.

The Iron Man.

"One man is knocked down by an automobile every twenty minutes in Los Angeles."—News Item.
You would think it would wear him out.—*Motor Chat.*

STATE HIGHWAY FUND CONTRACTS (Bond Funds, Including Federal Aid).

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE NOV. 13, 1925.						
442	III	Placer	37	C	¾ mile north of Colfax to Gold Run	8.03	Grading	C. R. Adams	$356,000 00	June 11, 1924	------
					AWARDED SINCE NOV. 13, 1925.						
488	VIII	Riverside	64	C	Desert Center to 4 miles west Hopkins Well	21.00	Grading	F. C. Payton	31,207 50	Nov. 30, 1925	200
489	VIII	San Bernardino	31, 58	F-E	Hicks to Daggett	18.52	Grading and Rock Surfacing	Ken Hodgman	179,092 12	Nov. 30, 1925	225
490	1	Del Norte	1	A	Head of Richardson Creek to Klamath River	2.00	Grade and Crushed Gravel or Stone Sur.	H. W. Rohl	96,457 50	Dec. 14, 1925	200
					Sub-total	41.52			$306,757 12		
					PENDING AWARD—None.						
					Total State Highway Fund Contracts Awarded and Pending Award	41.52			$306,757 12		

NOTE.—Primary construction covered by the above contracts does not include funds obligated on cooperative forest highway projects, prison camp road activities, or day labor jobs not being done under contract.

STATE HIGHWAY MAINTENANCE FUND CONTRACTS (Including Gasoline Tax Fund).

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE NOV. 13, 1925.						
M-64	VI	Merced	4	C, D	Merced River to Buhach	6.41	P.C.C. Pavement and Shoulders	H. H. Peterson	$166,168 97	Mar. 12, 1925	------
M-86	V	Monterey	2	H, I	One mile north of Bradley to San Ardo	12.10	Rock Borders	Fred Nighbert	39,600 00	June 17, 1925	------
M-91	IV	Santa Cruz	44	A	High Bridge Fall and Cleveland Dam Creek	------	R.C. Bridge and Culverts	A. J. and W. S. Wilson Co	18,004 50	July 13, 1925	------
					AWARDED SINCE NOV. 13, 1925.						
M-107	VIII	San Bernardino, Riverside	19	B, A	Ontario to Riverside	14.62	Asphalt Concrete Pavement	Steele, Finley	238,608 05	Nov. 30, 1925	150
M-108	IX	Kern, Inyo	23	D, E, G	Ricardo to Five Mile Canyon	36.70	Grading	Harry Wilson	21,332 81	Nov. 30, 1925	75
M-109	V	Santa Barbara	2	H	Carpinteria and 2 miles southeast	2.10	A.C. Surface and P.C.C. Widening	Cornwall Construction Co.	58,703 22	Nov. 30, 1925	125
M-110	VII	Los Angeles	4	B, C	Castaic School to 3 miles north of National Forest Inn	15.00	Macadam Surface	Fred W. Nighbert	62,842 50	Dec. 14, 1925	100
M-111	VII	San Diego	2	B	Carlsbad Crossing	------	Reinforced Concrete Girder Bridge	Coon Brothers	20,666 25	Dec. 14, 1925	125
M-112	VI	Kern	4	F	1 mile south of Delano to 1.8 miles south of Delano	0.75	Asphalt Concrete Pavement	Warren Construction Co.	16,635 38	Dec. 14, 1925	45
					Sub-total	69.17			$418,878 21		
					PENDING AWARD—None.						
					Total State Highway Maintenance Fund Contracts Awarded and Pending Award	69.17			$418,878 21		

NOTE.—The above obligations charged against the State Highway Maintenance Funds do not include funds from these sources obligated for general maintenance and for specific betterments being done under day labor authorization.

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CALIFORNIA HIGHWAYS

A BULLETIN ISSUED BY THE CALIFORNIA HIGHWAY COMMISSION FOR THE INFORMATION OF ITS EMPLOYEES AND THE PUBLIC

Vol. 3 JANUARY, 1926 No. 1

NEW HIGHWAY THROUGH DEADMAN'S HILLS, MONO COUNTY—This section of highway, an accomplishment of Division IX, was graded with General Maintenance Funds, as described in an article in this issue.

In this issue: CURING OF CONCRETE—RECENT CALIFORNIA EXPERIMENTS.

2 1926

CALIFORNIA HIGHWAYS

HARVEY M. TOY, Chairman;
N. T. EDWARDS and LOUIS EVERDING, Commissioners.

ROBERT M. MORTON, State Highway Engineer.

W. F. MIXON, Secretary.

We are pleased to permit publication of any of the matter contained herein or to loan cuts, and this privilege is extended newspapers and periodicals without restrictions.

FRANK B. DURKEE - - - Editor
P. O. Box 1103, Sacramento, California.

Vol. 3 JANUARY, 1926. No. I

CALIFORNIA HIGHWAY DEPARTMENT

CALIFORNIA HIGHWAY COMMISSION

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N. T. EDWARDS, Commissioner, Orange
LOUIS EVERDING, Commissioner, Arcata

R. M. MORTON, State Highway Engineer, Sacramento

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R. H. STALNAKER, Equipment Engineer
G. R. WINSLOW, Maintenance Engineer
C. L. McKESSON, Materials and Research Engineer

BEN H. MILLIKEN, Superintendent of Prison Road Camps
HERMAN B. WEAVER, Chief Accountant
LOWELL R. SMITH, Purchasing Agent

DIVISION ENGINEERS

T. A. BEDFORD, Division I, Willits
H. S. COMLY, Division II, Redding
F. W. HASELWOOD (Acting), Division III, Sacramento
J. H. SKEGGS, Division IV, San Francisco
L. H. GIBSON, Division V, San Luis Obispo
J. B. WOODSON, Division VI, Fresno
S. V. CORTELYOU, Division VII, Los Angeles
E. Q. SULLIVAN (Acting), Division VIII, San Bernardino
F. G. SOMNER, Division IX, Bishop
J. C. McLEOD, Division X, Sacramento

General Headquarters, Fifth Floor, Forum Bldg., Sacramento

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SECRETARY JARDINE THANKS CHAIRMAN FOR COOPERATION

CALIFORNIA'S AID IN ROAD CONSTRUCTION IS APPRECIATED

FEDERAL officials appreciate the cooperation of the State of California in furthering the road work of the United States. This sentiment is expressed by Secretary of Agriculture W. M. Jardine, in a letter of holiday greeting to Chairman Harvey M. Toy, as follows:

DEPARTMENT OF AGRICULTURE
WASHINGTON

December 31, 1925.

Mr. Harvey M. Toy,
Chairman, Highway Commission,
Hotel Manx, 225 Powell St.,
San Francisco, California.
Dear Mr. Toy:

As the year 1925 draws to a close, please accept my appreciation of the cooperation that you have given to the Department of Agriculture in its efforts to be of constructive service in the road work of the United States. It is only through such cooperation that effective progress can be made. In behalf of the department I thank you for your services and ask you to accept for yourself and your department our best wishes for the coming year and our hope that your splendid cooperation may be continued.

Very truly yours,

(Signed) W. M. JARDINE,
Secretary.

Keep the boy on the farm by making your roads so he can get to town in twenty minutes.

The Contractors' Association of Northern California at its recent annual convention in San Francisco adopted resolutions urging congress to continue present federal aid policies.

JANUARY 1926

California Highways

VOL. 3 No. 1

Building Highways With General Maintenance Funds

By F. G. Somner, Division Engineer, Bishop.

FOLLOWING rigid adherence to specifications, compiled after study of the best efforts of the nation's eminent authorities on concrete, macadam, or other types of pavement, we may with pride point to a completed section of highway, say 16 miles, a paved boulevard, wide and smooth. Such a road, it should be remembered, costs considerable money, but "East of the Sierra" there is a stretch of state road of 16 miles, from 20 to 30 feet in width, paid for from General Maintenance funds. Its cost per mile did not exceed the General Maintenance allotment. There is no choice here between pride and profit, modesty is set aside and the claim is made for both.

"Simple enough," the captious reader may declare, "a grader was dragged over the desert sand and sage brush and its trail called a road."

Doubters should look up the cost record, take a trip over this highway, and then say who wins.

Route Part of The Original System.

The California Highway Commission, in January, 1925, took over for maintenance an eighteen-mile section of county road in Mono County, extending from Magee Creek to Deadman Creek. The route lies through the "Deadman" country, along the base of the high Sierra, at an elevation of 7100 to 8000 feet. It forms a part of the original state highway system laid out and adopted as a result of the first bond issue of 1909. Its terrors are traditional; only the fittest have survived to find their way out when overtaken by the driving snow storms characteristic of the region.

When taken over, the road long since had been abandoned by the county as far as maintenance was concerned and was annually going from bad to worse. It was demolished finally, during the season of 1924 by a fleet of trucks hauling machinery and supplies for hydro-electric projects then under construction in Mono County. At the close of the hauling season nothing was left but deep ruts and chuck holes, the result of the struggles of truck drivers to find a way through after the county trail was no more. The opening of the road in the spring found it beyond repair. For miles no travelable way was in sight. The ruts had been converted into gulleys by the melting snow.

The county had no funds with which to undertake repairs and, if traffic were to be served, action by the Highway Commission was imperative. The section was taken over and the problem became one for Division IX to solve.

With the season of tourist travel fast approaching, and only "Best Temporary Road" signs to guide the bewildered motorist through the timber, no time was to be lost. Requests for engineering work orders and specific funds were forgotten, when, on May 19th, last, Foreman Paul Peak established his camp. He had a crew of nine men and equipment consisting of two Holt caterpillar tractors, a 5-ton and a 2-ton, a truck, two road graders, a scarifier and a scraper. No teams were employed either for clearing or grading. And on July 20th, the job was completed.

Short Cuts Bring Results.

Survey parties were not in evidence. With the assistance of the camp foreman, the relocation was flagged out and followed up, as the grading progressed, with such stakes as were necessary. *Short cuts and easy methods produced results commensurate with the purpose involved.*

"Easy enough," explains the skeptic, "a flat country, a 16-mile tangent."

Not so, the route lies through timbered hills, skirting the Mammoth Lakes, in sight of the famous Minarets, and alongside the Casa Diablo, scenic features that hardly signify desert plains.

Lack of funds, therefore, controlled. A line of least resistance had to be developed that, at the same time, maintained proper alignment and grade. Drainage conditions also governed the location to a considerable extent.

The formation of the district is generally of volcanic cinders and sand, which yielded in a satisfactory manner to the grading methods employed and afforded a very good surface. Lava rock was encountered in places.

The romantic character of the country and unusual camp environment were in marked contrast to the Mojave desert from which the men were transferred and they entered into the spirit of the project in a creditable manner.

The alignment, surface, and grades, with rather pronounced undulations, are all that may be wished for, and both the road and its surroundings are pleasant to look upon. With minor changes to be made during the season of 1926, a road will be provided, fast enough, and adequate for traffic for a considerable period.

Local Papers Commend Work.

The views reproduced in this issue of the Bulletin illustrate

(Continued on page 11.)

NEAR THE CASA DIABLO—*Above*, the new state highway between Casa Diablo and Deadman Creek, Mono County. *Below*, the old county road meandering over the plains as it was before the recent work of Division IX.

COLFAX-GOLD RUN SECTION INVOLVES HEAVY GRADING

IN THE LAND OF THE FORTY-NINERS—Views of recently completed state highway grade near Gold Run, Placer County. *Upper Left,* section of completed roadway with temporary surfacing to handle winter traffic. *Center,* explosives make easier the work of power shovels. *Lower Left and Right,* an eighty-foot cut and a ninety-foot fill, indicative of the heavy work required on this section. (Photos by Div. III.)

By F. W. Haselwood, Acting Division Engineer.

GRADING recently was completed on the Colfax-Gold Run unit of the Victory highway. This interstate highway, now Route 40 of the National highway system, crosses the Sierra Nevada mountains by way of Auburn, Donner Summit, Truckee and the Truckee River Canyon. The new section is eight miles in length and extends from the end of the oil macadam pavement, one mile east of Colfax, to the well-known old mining town of Gold Run, Placer County.

The new grade beyond Colfax follows in general the divide between the American and Bear River drainages. The country traversed is broken and irregular, and numerous deep cuts through sharp ridges and high fills across steep ravines were necessary to secure grades and alignment conforming to the standards now required on California state highways. There are no grades exceeding 6 per cent and no curves the radii of which are less than 300 feet.

The New And Old Roads Compared.

Interesting comparisons may be made between the new highway and the old state road it replaces. The old road is half a mile longer, has grades as steep as 12.5 per cent, many hairpin turns with radii as sharp as 40 feet, and over three times as many degrees of curvature as the new location. The embankments on the new road are 26 feet wide and the cuts 24 feet, exclusive of two-foot ditches. In comparison, much of the old road is barely wide enough for two machines to pass.

The revised alignment eliminates a grade crossing of the Nevada County Narrow Gauge Railroad by passing under a high steel viaduct. A dangerous subway under the Southern Pacific tracks is abandoned, the highway crossing the railroad at a new location.

Fred Grumm was right when he said, *"You have to move dirt to build a road."* On this eight-mile unit, 353,000 cubic yards of earth and rock were removed from cuts and placed in embankments, a movement of 44,000 cubic yards of excavation per mile. The cost of the grading and drainage structures was $345,000 or approximately $43,000 per mile.

Modern Equipment Does Work.

The work was done almost entirely by modern power equipment. The drilling was all done by compressed air and the material from the cuts was loaded by power shovels into trucks for transportation to fills. Two shovels, two fleets of trucks, and two compressors were worked three shifts daily, almost continuously, during the period of construction. Hand labor was used only for clearing and for sloping cuts and finishing the grade.

The contract was awarded on June 11, 1924, to C. R. Adams of Merced. Four hundred and fifty working days were allowed, fixing the date for completion as December 19, 1925. Mr. Adams began operations during the latter part of July, 1924, and continued diligently at a uniform rate of progress. He was always ahead of his schedule and finished on November 10, 1925. J. L. Piper was resident engineer for the California Highway Commission.

Curing of Concrete—Recent California Experiments

By C. L. McKesson, Materials and Research Engineer.

DURING the summer of 1924 a cooperative series of curing tests were conducted at Sacramento by the California Highway Commission and the Structural Materials Research Laboratory of Chicago. The primary consideration leading up to this experimental work was the possibility of the use of calcium chloride in lieu of ordinary water curing in the arid regions of California. The test series was broadened in scope to include different periods of wet earth curing, curing with asphaltic curing paper, and with sodium silicate.

Bulletin No. 15* recently issued by the Structural Materials Research Laboratory of Chicago, gives a full description of these tests, of the results obtained, and of the conclusions reached. A brief resume of this investigation follows, but it is suggested that those desiring to study the matter in detail secure a copy of the bulletin. The California Highway Commission has a limited number of bulletins for distribution and copies also may be obtained from the Structural Materials Research Laboratory of Chicago or the Portland Cement Association.

Sacramento was chosen as a site for these tests because of the slight probability of rain, the low relative humidity and high mean temperatures during the summer months. The tests were made during July, August, September, and October and climatic conditions during this period were quite unfavorable for the proper curing of unprotected concrete, but are typical of those encountered in semi-arid regions.

Description of Experiments.

The curing experiments were carried out on plain concrete beams made out-of-doors and cured in the open by the following methods (after removal of forms at 16 to 24 hr.):

(1) Covering with 2 in. earth, wet for 3, 7, 14, 26 and 88 days;
(2) Air curing, no surface treatment;
(3) Covering with asphaltic paper;
(4) Flake calcium chloride, 1½, 2, 2, 2½, 3 and 5 lb. per sq. yd. sprinkled over the surface;
(5) Commercial sodium silicate (41° Baume); applied with a brush, undiluted, 1 to 1½ and 1 to 3 solutions.

The investigation included transverse tests and tests for surface hardness on five hundred and eighteen 7 x 10 x 38 in. beams and compression tests on one hundred and seventy-five 6 by 12 in. cylinders and prisms. The beams were tested at ages of 3 to 90 days with the cured surface in tension. The surface hardness of the concrete was measured by a ball-indentation test. The cylinders were cured in damp sand and tested at ages of 7 to 90 days. The prisms were cured with wet earth and calcium chloride and tested at 28 days.

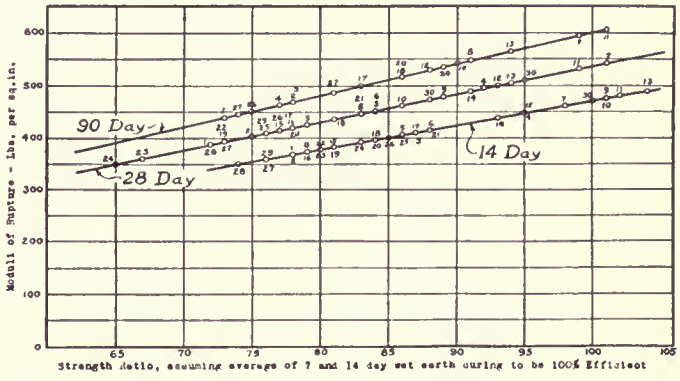
The concrete was machine-mixed in the proportion of 1-2.2-3.0 by loose volume, and contained 6 sacks of cement per cubic yard. The consistency of the concrete was about that used in hand-finished concrete pavements (slump of about 1½ in.). A few tests were made with wetter concrete. In 110 beams and 37 cylinders calcium chloride (2% by weight of cement) was used as an admixture.

In comparing the relative efficiency of the curing methods, the strength of concrete cured with earth wet 7 and 14 days (which showed practically identical results) was taken as the standard; the "strength ratios" for other methods were based on these values.

The moduli of rupture and strength ratios obtained by all of

(Continued on next page.)

CONCRETE CURING TESTS—Made by the California Highway Commission in cooperation with the Structural Materials Research Laboratory of the Lewis Institute at Sacramento, California, July to November, 1924, curve showing relative efficiency of various methods of curing.



METHODS OF TREATMENT AND REFERENCE NUMERALS SHOWN ON ABOVE CURVES.

1. Air only—no curing.
2. Air only—2% Admixture CaCl2.
3. Curing paper—top only.
4. Curing paper—top and bottom.
5. Curing paper—top only—1.10 consistency.
6. Curing paper—top and bottom—1.10 consistency.
7. 2" Earth, wet twice daily for 14 days.
8. 2" Earth, wet twice daily for 14 days, 2% admix. CaCl2.
9. 2" Earth, wet twice daily for 14 days, 1.10 consistency.
10. 2" Earth, wet twice daily for 14 days, 1.25 consistency.
11. 2" Earth, wet twice daily for 7 days.
12. 2" Earth, wet twice daily for 7 days, 2% admix. CaCl2.
13. 2" Earth, wet twice daily for 3 days.
14. 2" Earth, wet twice daily for 3 days, 2% admix. CaCl2.
15. 1½ lbs. CaCl2 per sq. yd.
16. 2 lbs. CaCl2 per sq. yd.
17. 2½ lbs. CaCl2 per sq. yd.
18. 2½ lbs. CaCl2 per sq. yd., 2% admix. CaCl2.
19. 2½ lbs. CaCl2 per sq. yd., washed off after 3 hrs.
20. 2½ lbs. CaCl2 per sq. yd., washed off after 1 day.
21. 2½ lbs. CaCl2 per sq. yd., wet earth subgrade.
22. 2½ lbs. CaCl2 per sq. yd., dry earth subgrade.
23. 2½ lbs. CaCl2 per sq. yd., 1.10 consistency.
24. 2½ lbs. CaCl2 per sq. yd., 1.25 consistency.
25. 3 lbs. CaCl2 per sq. yd.
26. 5 lbs. CaCl2 per sq. yd.
27. N. Brand Na2Sio3—One application.
28. 1-1½ Na2Sio3—Three applications.
29. 1-3 Na2Sio3—Three applications.
30. 2½ lbs. CaCl2 per sq. yd. in concrete forms.
31. 2" Earth, wet twice daily for 28 days.
32. 2" Earth, wet twice daily for 90 days.

TABLE 1.

Method of curing	Modulus of rupture of 7 by 10 inch plain concrete beams, pounds per square inch					Strength—Ratio per cent				
	3d.	7d.	14d.	28d.	90d.	3d.	7d.	14d.	28d.	90d.
2 inch wet-earth covering applied 16 to 24 hours after molding and left in place for 7 or 14 days	-------	445	470	535	600	-------	100	100	100	100
2 inch wet-earth covering applied 16 to 24 hours after molding and left in place for 3 days	340	435	490	505	565	100	98	104	94	94
Beams molded and cured in concrete forms using surface application of calcium chloride, 2½ pounds per square yard, placed 16 to 24 hours after molding and not removed	-------	-------	470	470	535	-------	-------	100	88	89
Covered with asphaltic paper 16 to 24 hours after molding until 1 day before test (average for paper on top only and top and bottom)	-------	410	430	470	465	-------	92	91	88	78
Beams molded in wood forms and cured with surface application of calcium chloride, 2½ pounds per square yard, placed 16 to 24 hours after molding and not removed	370	390	410	415	495	109	88	87	78	83
Air curing; no surface treatment	295	345	365	385	435	87	78	78	72	73
Sodium silicate, applied with brush 16 to 24 hours after molding (average for undiluted, 1 to 1½ and 1 to 3 solutions)	-------	340	355	395	445	-------	76	76	74	74

*Studies of Curing Concrete in a Semi-arid Climate, by H. F. Gonnermann and C. L. McKesson.

the methods of curing are shown graphically in Fig. 1. The strengths for the more important methods of curing are also given in Table 1.

Field Tests Also Made.

During the season of 1924 a limited number of field tests were also made by the California Highway Commission for the purpose of determining the relative efficiency of curing with the use of flake calcium chloride as compared with usual water curing. The result of these tests shown in Table 2 are in general accord with the test series of 1924 already described.

It will be seen from Table 1 and from Figure 1 that very satisfactory showings were made at all ages with wet earth curing of three to fourteen days. The practice in California heretofore has required fourteen days of watering and it was realized that an appreciable reduction in curing time with a correspondingly earlier opening of pavement to traffic would effect a large saving to the Highway Commission in construction costs and in the reduction of costs of maintaining expensive detours.

The elimination of detours and added comfort and safety to the traveling public also made it exceedingly desirable to reduce the curing period to the minimum consistent with safe construction practice.

Mr. R. M. Morton, State Highway Engineer, therefore, directed that a complete series of field tests, under normal construction conditions, be conducted during the summer of 1925 to fully verify the conclusions arrived at as a result of the previous laboratory study.

Field Tests Made in 1925.

The 1925 Field Series of Curing Tests by the California Highway Commission were made on a pavement-widening project fourteen miles from Sacramento, California. The strip of pavement was 6′ in width and 7″ in thickness. The concrete was mixed in a central mixing plant and hauled to the work in side dump trucks. The mixing, placing, and finishing were all conducted in the usual way and the pavement is typical of average pavement.

Seven separate sections, each representing a day's run of from 500 to 1500 lineal feet, were designated for the test and each section received different curing treatment. All sections were covered with burlap immediately after laying and with earth on the following morning. Section 1 was watered 14 days; Section 2, 12 days; Section 3, 10 days; Section 4, 8 days; Section 5, 7 days; Section 6, 3 days; and Section 7, 0 days. In all cases, earth covering was removed in 14 days. At the time of the placing of concrete, 6″ x 12″ cylinders, in pairs, were molded from concrete taken at five stations in each section. These 10 specimens from each section were cured in water at the laboratory for 27 days and broken on the 28th day.

Five cores were drilled in each section for 14-, 21- and 28-day tests. Each age and condition was thus represented in the test by five cores. Some honey-combed or otherwise defective cores were obtained, but these were rejected and drilling continued until a full set of apparently perfect cores was secured.

The concrete in the 28-day laboratory-cured specimens having been taken from the identical batches of concrete from which cores were later drilled enabled a comparison to be made of the strength of cores on a basis of the relative strength of concrete used in each. The relative efficiency or strength ratio for each method of curing and at each age of test was obtained by comparing the average strength of the cores with the average strength of 28-day laboratory-cured cylinders from the same section.

Table 3 gives the results of the tests of these cores and the relative efficiency of various periods of watering.

Section 7 with dry earth covering but with NO WATERING, gave high strength ratios in early tests showing that mixing water, conserved to some extent by a covering of dry loose earth, provided nearly enough water to insure proper hydration through the early curing periods. The concrete cured in this way, however, failed to show continued increases in strength between 14- and 90-day tests. In drilling, it was found that the surface of the concrete cured without water was much softer than on the sections which had received water treatment. This verifies the results of the Sacramento Curing Tests in which it was found that concrete which received no water had only about three quarters of the surface hardness of similar concrete cured in water even for 3 days.

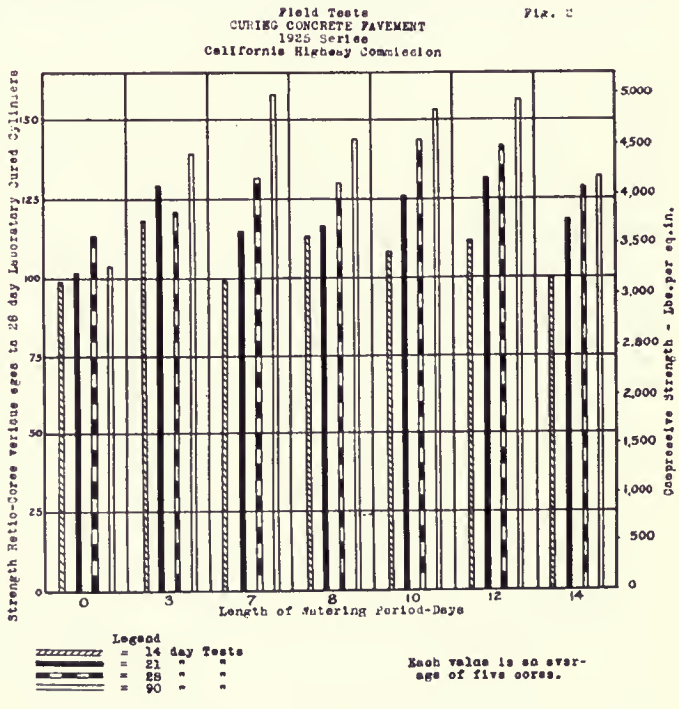
THREE-DAY WATERING on Section 6 gave the highest strength in 14-day tests. This almost exactly checks results in the Sacramento Test of 1924. It is quite apparent that 3-day watering provides all of the water necessary to carry on hydration through a 14-day, or even a 21-day curing period. At the same time, it permits of a higher temperature in the concrete at an early period in the curing and thus accelerates early hardening. It does not provide any free moisture to reduce strength at time of test.

TABLE 2.

Average Compressive Strength.

Location of experiment	No. of samples	6 by 6 by 12 inch molded specimens		4½ inch cores from pavement		Efficiency of calcium chloride,[1] per cent	Remarks
		Cured with water, 28 days	Cured with calcium chloride, 28 days	Cured with water, pounds	Cured with calcium chloride, pounds		
(X–Sac.–4-B) Sacramento-Stockton highway, near Sacramento.	24	----------	----------	[2]14,292	[2]14,218	98	[1]Hot and dry (water-cured concrete 57 days old. Concrete cured with calcium chloride 70 days old).
	20	----------	----------	[2]5,064	[2]5,042	99	[2]Cores drilled and at 1 year age.
(VII–L. A.–2–BC) Ventura–Los Angeles highway near Calabasas.	32	3,064	2,763	----------	----------	91	
	28	----------	----------	4,057	3,294	81	Hot and dry.
(VII–Ventura–2-A) Los Angeles highway near Newbury Park.	12	----------	----------	3,491	3,093	88	Hot and dry.
(I–Hum.–1–GH) Eureka–Arcata highway at Arcata.	72	3,887	3,545	----------	----------	92	Experiment in October. Weather cool, humidity high (70 to 90 per cent). Some rain.

[1] Efficiency of calcium chloride curing, assuming water curing to be 100 per cent efficient.
[2] Cores drilled with Calyx Shot Drill. Cores tested were free from visible defects. Each strength is an average of 5 cores.



SEVEN- AND EIGHT-DAY WATERING (Sections 5 and 4) gave satisfactory strengths at all ages. The strengths and strength ratios for these two treatments were about the same except for 14-day tests. In this average, one of the five cores broke unaccountably low and reduced the average somewhat.

TEN- AND TWELVE-DAY WATERING (Sections 3 and 2) gave about the same strengths as the shorter watering periods in 14-day tests, but showed a large gain in 21-, 28- and 90-day tests.

FOURTEEN-DAY WATERING (Section 1) heretofore accepted as the standard in California, fell behind other periods of watering in most instances. It makes little better showing than no watering in the earlier tests but was decidedly superior to the latter method in 90-day strength tests and in surface hardness tests.

Figure 2 shows the results of these field tests and Figure 3 shows temperature and humidity during the test period. The curing period included some very hot dry weather. There was no rainfall after the expiration of the watering periods and only .05 inches during the entire period of the test.

The field curing tests of 1925 fully corroborate the earlier tests in that they show little practical benefit to be derived from watering pavement longer than seven days after placing.

Amount of Water For Curing.

In the Sacramento Curing Tests in 1924, concrete of normal consistency contained mixing water amounting to about 8% of the combined weight of the cement, sand and gravel. It was found in this test that the original mixing water, if conserved, was sufficient to carry hydration through a 90-day curing period. The relative strengths obtained by some of the more important methods of curing are shown in Figure 4 which also shows the change in moisture content in the concrete measured in terms of original mixing water. It will be seen that concrete which had no watering, lost about 32% of its moisture content while concrete watered only 3 days, lost only 7.1% of the original mixing water. This indicates that treatment during the first three days after the placing of concrete has much to do with subsequent strengths.

The rate of loss of moisture is dependent upon a number of conditions including size and surface area of the specimen, temperature and humidity of air, and condition of subgrade. In the Sacramento 1924 Series, specimens were cured on waterproof paper to prevent escape of water to subgrade, and a careful record was made of humidity and temperature. The temperature was high and humidity low during these tests and conditions were very favorable for rapid drying of concrete.

The results of the several tests mentioned in this report are applicable to pavement or other concrete resting upon a subgrade and exposed on one surface only. They would also probably apply to concrete in walls or abutments, but concrete in thin structural members has a much larger relative surface area and evaporation of moisture is probably more rapid.

In connection with the curing tests of concrete beams, a study was made of the loss of water in concrete placed in pans and exposed in sunshine.

From these tests it was determined that the loss of moisture was very rapid during the first three days of exposure. After the first three days, the rate of loss was much lower.

In Figure 4 it will be noted that watering up to the time of test at 90 days age resulted in an increase of moisture content over the amount used in mixing. This method of curing provided free moisture not necessary for hydration during this length of curing period, and the strength is appreciably less than for specimens watered shorter periods. These tests indicate that, at 90 days, there is a well defined relation between moisture content in concrete and flexural strength in concrete. A substantial increase or decrease in water content (based on mixing water) is reflected by a decrease in strength.

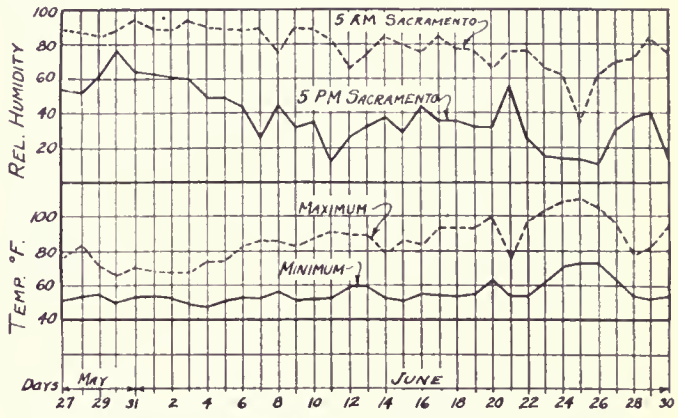


Fig. 3. Temperature and humidity during pavement curing tests in 1925. Sect. 1 laid May 27 and Sect. 7 laid June 3.

Influence of Temperature on Curing.

It has long been known that the early hardening of cement is retarded by low temperatures and accelerated by high temperatures. Variations in temperature during the curing period similarly affects concrete in roads or structures.

In considering the relative efficiency of various curing methods where early strengths are required, it is reasonable, other conditions being equal, that preference should be given to a method which would give the highest temperature in the concrete during the curing period. Ponding or covering with earth, wet twice daily, results in a considerably lower temperature in concrete than where concrete is similarly exposed under a dry earth covering or without any covering.

A short watering period permits of the earlier drying of the covering and of increased temperature thereafter. It seems reasonable that this had its influence in producing relatively high strengths in concrete cured with short periods of watering.

All of the California curing tests were conducted in the summer weather and should not, without adjustment, be applied to winter conditions. It is quite possible that the time of opening might be based on mean temperature during the curing period.

(Continued on page 9.)

TABLE 3.

California Highway Commission Curing Tests—Compressive Strengths.

6 by 12 inch Moulded Cylinders and 4½ by 7 inch Drilled Cores (1925 Series).

	Watering period	Age of test								
		[1]28 days, 6 by 12 inch cylinders	14 days		21 days		28 days		90 days	
			[2]Cores, pounds per square inch	[3]Strength, ratio	[2]Cores, pounds per square inch	[3]Strength, ratio	[2]Cores, pounds per square inch	[3]Strength, ratio	[2]Cores, pounds per square inch	[3]Strength, ratio
Section 1	14	3,296	3,285	100	3,873	118	4,229	128	4,301	132
Section 2	12	3,105	3,468	112	4,103	132	4,414	142	4,895	157
Section 3	10	2,930	3,123	107	3,694	126	4,225	144	4,475	153
Section 4	8	2,968	3,366	113	3,483	117	3,877	130	4,264	144
Section 5	7	3,118	3,073	99	3,596	115	4,101	132	4,924	158
Section 6	3	3,356	3,948	118	4,323	129	4,068	121	4,659	139
Section 7	0	3,378	3,329	99	3,436	102	3,814	113	3,465	103
Average		3,164	3,370	106	3,787	119	4,104	130	4,426	141

[1] 6 by 12 cylinders made in accordance with A.S.T.M. standards, and cured in water for 28 days. Each strength an average of 10 specimens except Section 7, in which only 4 specimens were made.
[2] Cores drilled with Calyx Shot Drill. Cores tested were free from visible defects. Each strength is an average of 5 cores.
[3] Strength ratios are ratios of core strengths to 28 days strengths of cylinders from same section.
Concrete Mix 1-1.9-3.8 using 6 sacks cement per cubic yard.

MEN FROM FOLSOM PRISON OPEN SOUTHERN SIERRA TO TRAVEL

KERN RIVER CONVICT JOB—Views in the Kern River Canyon, east of Bakersfield, where a section of the state highway built by convicts from Folsom Prison was recently completed and opened to traffic. (1) a section of completed highway, showing parapet wall built by prisoners; (2) Ralph W. Brown, camp superintendent; (3) prisoners operating jack hammers in solid rock; (4) storm water gutter at inside of roadway which carries water to culverts; (5) rock guard rail at outer edge of grade; (6) prisoners building rock rip rap to protect highway grade during high water; (7) view showing rocky formation of the canyon; (8) closeup of the rock parapet shown in number one.

Safety First.

Tony was having his second son christened and, being very anxious to have his name recorded correctly on the birth certificate, remarked to the clergyman:

"Will ya pleeze nama my babe same as I give ya?"

"Tony, why do you make such a request?" asked the clergyman.

"Well, ya see—it's a lika dis: My firsta boy I tella ya I wanta heem chris'nd 'Tom' and ya putta 'Tomass' on heesa paper. Now, I wanta dis boy nama 'Jack' and no wanta heem name 'Jackass'."
—*San Joaquin Power.*

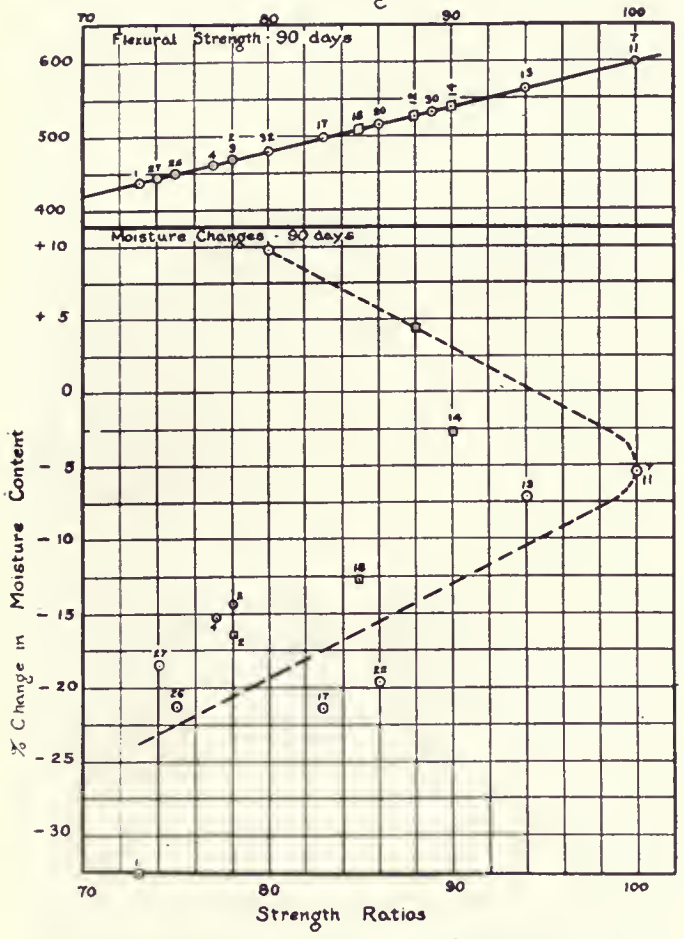
CURING OF CONCRETE—RECENT CALIFORNIA EXPERIMENTS

(Continued from page 7.)

Curing Period and Moisture for Continued Hydration.

The proper length of the curing period in this connection, is the time necessary for concrete to develop sufficient strength to safely permit of its use for the purpose for which it was constructed. The length of time will obviously be dependent upon the quality of concrete, temperatupre during curing period, and the efficiency of the curing method. With concrete of the quality used in these tests, with water curing of three or more days duration, and with summer temperatures, compressive strengths above 3000 lbs. and flexural strengths of over 500 lbs. were obtained in 14 days.

Fig. 4.



Reference numerals indicate methods of curing as in Fig. 1

Such concrete would be safe for use in concrete pavement or highway structures.

Concrete made from satisfactory materials continues to develop strength for years after the termination of the curing period. This added strength adds to the factor of safety. It is not necessary and it may not be possible, to supply water during a curing period in sufficient quantity to carry on hydration for a period of years.

It has been shown* that, where hydration in concrete is stopped due to a lack of moisture, it will resume when water is applied even after a long lapse of time, and that thereafter the concrete will increase in strength more or less normally. Concrete in roads will be subjected to occasional rainfall after the curing period ends and moisture for continued hydration will thus become available from time to time. In the curing of concrete, we should, therefore, be most concerned with the water necessary to develop the required strength in the earliest possible time.

Curing With Flake Calcium Chloride.

Curing with a surface application of flask calcium chloride (2½ lbs. per square yard of surface) was found to be 83% efficient in 90 days in the Sacramento, 1924, curing tests. Field tests in 1924 Table 2 indicated this method to be 81 to 99% efficient. The ball penetration tests in the Sacramento Tests of 1924 showed a somewhat softer and more friable surface on specimens cured with calcium chloride and some scaling has been noted on pavement cured in this manner.

In view of the fact that 3-day water curing is very effective even under most adverse conditions, it does not seem that recourse to calcium chloride would be justified except under very unusual circumstances such as desert construction and under such conditions, the tests do not indicate high efficiency for the calcium chloride.

Asphaltic Curing Paper.

Retarding the evaporation of mixing water by covering the concrete with asphaltic curing paper immediately after placing the concrete is a method which seems to have possibilities. Curing with asphaltic paper in the tests described gave fair strengths and very good surface hardness. In these tests the curing paper was not placed until the day following the pouring of the concrete. Better results would doubtless be obtained by immediately covering the concrete before any of the mixing water has escaped. In structural work forms might be lined with this material and mixing water conserved for hydration.

Conclusions.

The various tests described above seem to justify the following conclusions:

1. That seven days of wet earth curing (or watering) is ample to provide moisture for hydration through a curing period of 28 or 90 days.

2. That this watering period might be reduced to 3 days where concrete is of high class quality and where a substantial saving can thus be effected.

3. That during summer weather concrete pavement may be opened to traffic in 14 days. (During cold weather the hardening of concrete is retarded and the time of opening should depend upon the actual conditions in each case.)

*Effect of Age and condition of Storage on Compressive Strength of Concrete, by H. F. Gonnermann, Proceedings American Concrete Inst., 1918.

ADDITIONAL EQUIPMENT PURCHASED FOR MAINTENANCE OF NEW ROADS

THE 1711 miles of county road on state highway routes taken over for maintenance by the Commission on January 1st, in accordance with the provisions of Assembly Bill 589, (Chap. 234, Laws of 1925), has necessitated the purchase of considerable additional equipment.

Recent purchases include the following:

30 8′ rubber-tired leaning-wheel graders.
4 8′ rubber-tired leaning-wheel scarifier graders.
7 7′ rubber-tired leaning-wheel graders.
40 one-man tractor graders.
5 small tractors.
2 30-h.p. tractors.

While a few of the graders are for replacement of others worn out in service, practically all of the new equipment is needed for use on the roads to be maintained. The total expenditure for the above equipment will approximate $130,000.

A considerable reduction in price was again secured by quantity purchase of both graders and tractor graders. It is the intention of the departments concerned to extend this policy as much as possible in making future purchases of equipment.

Woman's Rights.

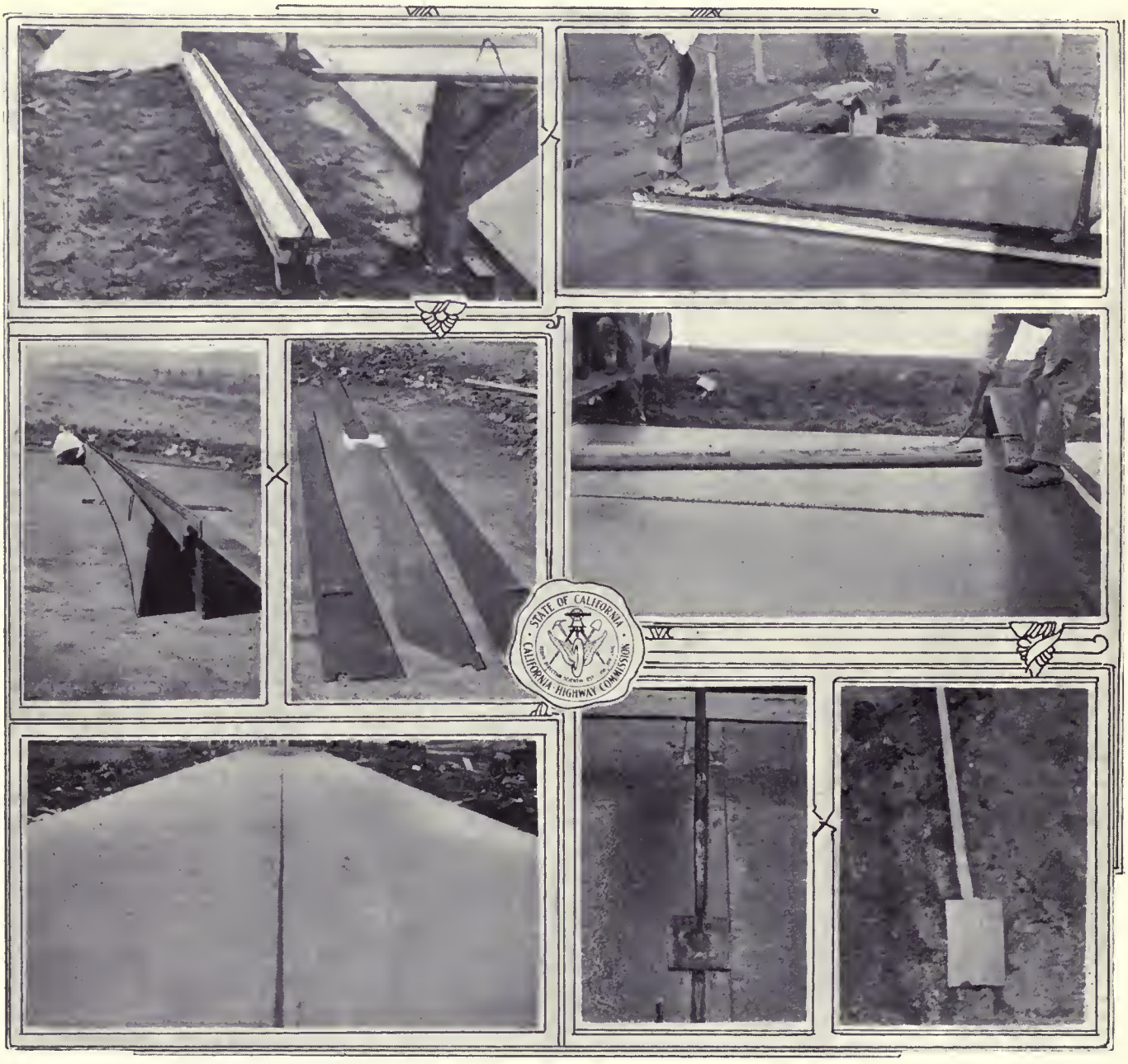
The occupants of the parlor car of the Limited were startled by the abrupt entrance of two masked bandits.

"Throw up yer hands," commanded the bigger of the two. "We're gonna rob all the gents and kiss all the gals."

"No, partner," remonstrated the smaller one gallantly. "We'll rob the gents but we'll leave the ladies alone."

"Mind your own business, young fellow," snapped a female passenger of uncertain age. "The big man is robbing this train."

DIVISIONS TRY NEW DEVICES FOR MAKING EXPANSION JOINTS



GROOVER AND HEADER PLATES FOR MAKING EXPANSION JOINTS AS DEVELOPED IN DIVISION VII—*Upper left,* groover for forming longitudinal joint. *Upper right,* making the impression in the soft concrete. *Right center,* removing groover after making impression. *Lower right,* finishing the longitudinal joint and tool used for this purpose. *Lower left,* finished longitudinal groove or joint. *Left center,* plates used in making transverse joints. The view at the extreme left shows relative position of plates which are held together by clips forming rigid header three-quarter-inch thick.

AN IMPORTANT problem in connection with the construction of concrete pavements, which has been given much thought by engineers, is the forming of a satisfactory expansion joint. The ideal to be attained is a joint which will properly take care of expansion and contraction, within a width that will not cause severe impact by traffic passing over the pavement surface.

A common practice has been to make the joint 1½ inches wide by the use of header boards. A serious fault of this method has been the obstacle encountered in removing the boards without damage to the ends of the pavement slab, as frequently results when the header is removed shortly after the placing of the concrete. If left for any length of time, it is often difficult to remove at all.

Metal Plates are Tried.

To overcome these defects, and yet continue the practice of constructing asphalt and sawdust joints, several of the divisions of the California highway organization have been experimenting with *metal* header plates, which make possible a joint with a width of less than one inch.

Headers of this type were used recently in connection with the paving of the San Mateo-San Onofre Creek line change in San

Diego County, Division VII. The work was done under the direction of Resident Engineer W. D. Eaton, who has been studying for some time the development of plates of this type. Similar devices are being tried in Divisions VIII and X, but detail discussion of the results is not yet available.

The wooden headers formerly used were usually 1½ inches wide at the top, tapering to one inch at the bottom, to facilitate removal. The additional width at the top added nothing to the joint in taking up pavement expansion but did increase the probability of impact by traffic.

The new type of header, as developed in Division VII, consists of three ¼-inch *metal plates,* cut to conform with the proposed cross-section of the pavement, and held together by means of six small clips. The outside plates are constructed in halves while the center plate is in three parts, so that, when assembled, the middle section of the center plate laps the joints in the outside plates, making the header rigid.

The assembled header is held in place temporarily with stakes, the concrete being poured, tamped, and finished in the usual manner. The concrete is edged on both sides of the header, and when the pavement has set the plates are removed.

No difficulty in removing the header is reported, nor is the concrete broken, as often occurs with other types. The center section, of three parts, is pulled out first by the use of hooks applied to notches in the plate. This section is oiled before it is placed in position, and when it is removed, the two outer plates fall together and are easily lifted out of the pavement.

Joints constructed with the three-*plate* header have a uniform width extending from the surface of the pavement to the subgrade. The plates are practically indestructible and over any considerable period should prove less costly for construction of joints than the wooden types.

Groover Also Developed.

Another device used on the San Diego job, and also developed by Mr. Eaton, after a trial of several different devices in Division VII and in other divisions, notably Divisions VIII and X, is a marker or groover used to make a longitudinal groove 1½ inches deep along the center line of concrete pavement.

The groove comes to a sharp angle at the bottom and creates a vertical plane of weakness running longitudinally in the center of the pavement. (Markers similar to this were used in Los Angeles City for a number of years to provide better traction on concrete pavements and also to cause cracks to form in the markings rather than in the pavements.) Stresses which occur in the pavement slab cause the pavement to crack along the plane of weakness which extends from the bottom of the groove vertically to the subgrade.

A longitudinal joint may be formed by this method with less difficulty and at a lower cost than by the use of parting strips of wood or other material. Placing of longitudinal parting strips in concrete pavement, true to line and grade, is quite difficult. If the strips are slightly submerged there is a tendency for the concrete to ravel along the joint, and if they project the finishing of the pavement surface is interfered with. When the kneading type of finish is used, the transverse movement of the machine has a decided tendency to force the center parting strip out of line. This results in a crooked center joint.

The use of the "V" groover does away with the need of parting strips on *second-story* work, while in pavements having a thickness of nine inches at the center, the parking strip may be submerged at least three inches below the surface of the concrete. In Division VII, the practice has been to firmly stake to the subgrade a wooden separator strip ½" thick and 5" in height in position. This leaves but 2½" of concrete to break to form the center joint.

Apparatus Required.

Apparatus required for forming the longitudinal groove consists of two pieces of 2" x 6" shod with a metal plate which is provided with a "V"-shaped projection 1½ inches deep and running the full length of the board, generally ten feet long.

After the pavement has been finished full width, a chalk line is stretched any desired distance along the center and a straight line "snapped" in the soft concrete. The groover is then centered on the marked line and pressed into the soft concrete under a man's weight, assisted by light tamping with a hammer or pick.

The impression left in the pavement is smoothed and finished with a specially constructed finishing tool, which fits the groove. This tool is provided with a long handle for operating from a bridge.

Results so far in Division VII have been quite satisfactory. In addition to forming a longitudinal joint, the impression made by the groover furnishes a guide for painting the center traffic line on new pavements.

LOS ANGELES STRIVES TO EQUAL STATE'S RECORD FOR CONCRETE

UNDER the heading "High Strength Concrete on State Highway," the *Municipal Employee,* official publication of the city employees of Los Angeles, has the following to say regarding the very high strength concrete secured on the recent Eureka-Arcata paving project on the Redwood highway, in Humboldt County:

> "The May issue of CALIFORNIA HIGHWAYS gives details concerning a new pavement just completed at Humboldt Bay in which unusually high strengths have been obtained. On 28-day tests the maximum was 6930 pounds, and the minimum 3160 pounds. The average of 64 tests was practically 5000 pounds, or 4980 pounds per square inch. This was obtained through the use of clean aggregate, high quality cement, mechanical tamper, and favorable weather for curing. A great deal of attention was paid to the grading of the sand and the aggregate.
>
> **This sets a very high record for highway work and one which should stimulate all inspectors and engineers to put forth every effort to accomplish results of a similar quality."**

MAINTENANCE BUILDS MONO ROAD

(Continued from page 3.)

the character of the country traversed and the "before" and "after" conditions. Further convincing testimony that general maintenance funds applied to road construction have produced satisfactory results is provided by the local press, from which the following is quoted:

> **"One of the most appreciated improvements, in grades, alignment and surface made in recent years, is the stretch of sixteen miles recently completed between Convict Creek and Deadman Creek, Mono County. That road, formerly the most trying trip on this slope, is now a wide and fast highway."**

And thus a way was found to circumvent the omnipresent lack of funds. A most formidable barrier to through travel on Route 23 between Mojave and Alpine County has been removed. The terrors of the Deadman hills exist now only as memories and Inyo and Mono approaches to the scenic wonders of the high Sierra country may be reached in comfort and safety. A heretofore little known section of California, destined someday to be the playground of millions, has been made more accessible and has moved a step nearer, the writer believes, to its ultimate destiny.

A rich but very eccentric man died. The clergyman, who was young and new to the parish, thought it a fitting opportunity to call and comfort the widow. "You must not grieve," he told her. "The body that lies here is not your husband. It is merely a husk, an empty shell—the nut has gone to heaven."

WHAT THE DIVISIONS ARE DOING

DIVISION IV.

HEADQUARTERS, SAN FRANCISCO.

JOHN H. SKEGGS, DIVISION ENGINEER.

Counties of San Francisco, Marin, Sonoma, Napa, Contra Costa, Alameda, Santa Clara, Santa Cruz, and San Mateo.

SEVEN and a half miles of splendid new 20-foot concrete pavement was the Christmas present of the Commission to the people of northern Sonoma County. The new section of "second-story work" on the Redwood Highway, extending from the Russian River to Mark West Creek, was opened to traffic on December 21st. The contractor is now engaged in completing culvert extensions and the placing of quarry waste shoulders.

Grading of two line changes, at Mark West Creek and near the north city boundary of Santa Rosa, is now progressing and the work will be completed for this season by the placing of crushed rock surfacing on these two sections.

Contra Costa Job Completed.

Widening of the state highway in Contra Costa County, between San Pablo Creek and El Ciervo, has been completed and accepted by the Commission. The improvements in alignment and the widened pavement are being favorably commented upon by motorists. The new width of the surfacing is thirty feet.

S. A. Martindale has completed the placing of approximately two miles of new standard guard rail on the Skyline Boulevard between San Francisco and Kings Mountain, San Mateo County.

DIVISION VI.

HEADQUARTERS, FRESNO.

J. B. WOODSON, DIVISION ENGINEER.

Counties of Fresno, Madera, Merced, Mariposa, Kings, Tulare, and Kern, north of the Tehachapi.

THE Federal Paving Company has completed the placing 8.2 miles of asphalt concrete surfacing on the trunk highway north of Bakersfield. The old concrete pavement has been used as a base for the widened and thickened pavement. Rock borders are now being placed.

Additional land has been purchased to enlarge the maintenance stations at Los Banos, on the Pacheco Pass highway, and at Lemon Cove, on the Sequoia Park lateral.

Fresno County has awarded a contract to the A. J. and J. L. Fairbanks Company for the construction of the Coal Creek cutoff, west of Coalinga, a section of the Sierra to the Sea lateral. When completed, the section will be taken over as a part of the state highway and placed under state maintenance.

DIVISION VII.

HEADQUARTERS, LOS ANGELES.

S. V. CORTELYOU, DIVISION ENGINEER.

Counties of Los Angeles, Ventura, Orange, San Diego, and eastern Kern, south of Mojave.

ON THE Oceanside-San Onofre reconstruction project, in northern San Diego County, placing of "second-story" pavement has been completed for a distance of four miles. Grade widening has been finished from the San Onofre end of the project to the Las Flores under crossing.

Placing of concrete pavement on the Whittier Boulevard extension will be completed in the immediate future.

Curves to be Eliminated.

With the exception of an important line change near the Big Tujunga Wash, which will eliminate four dangerous curves, practically all grading has been completed for the widening of the state highway between San Fernando and La Canada on the Foothill Boulevard. Grading of the line changes is now in progress. Placing of flush concrete shoulders to widen the pavement from 15 to 20 feet is in progress.

On the contract for paving from Las Flores Canyon to Latigo Creek, between Santa Monica and Oxnard, fills are being dyked and flooded in connection with the preparation of the subgrade. Rough grading has been completed from Las Flores Canyon to Zuma and is in progress between Zuma Canyon and the easterly end of the Hauser contract.

Placing of sub-base for the asphalt macadam pavement is now in progress on the South Coast Highway from Laguna to Newport, in Orange County. Four miles will be paved with cement concrete and 5.8 miles with asphalt macadam.

DIVISION VIII.

HEADQUARTERS, SAN BERNARDINO.

E. Q. SULLIVAN, ACTING DIVISION ENGINEER.

Counties of San Bernardino, Riverside, and Imperial.

TWO important reconstruction projects have been completed and opened to traffic in Division VIII.

Widening and thickening of the old county pavement from the Santa Ana River bridge to the west city limits of Redlands, an important section of the San Bernardino-Redlands section of the state highway, has been completed. The new pavement has a width of 20 feet with a minimum thickness of five inches. It has two-foot rock borders on either side and the shoulders have been graded evenly to the curb line. Local property owners are considering the installation of curbs and gutters at their own expense. Basich Brothers were the contractors and R. L. Young, resident engineer.

NEW ROAD AT BIG BEAR LAKE—Views of reconstruction recently completed on this popular San Bernardino mountain highway. The new and old roads are shown at the right.

Fawnskin Grading Completed.

Another reconstruction project in Division VIII was the rebuilding of a section of the scenic Rim of the World highway in the San Bernardino mountains, from the dam at the lower end of Big Bear Lake to Fawnskin. The improvement consists of a relocation of the road along the lake shore and the grading of a roadbed to a width of 20 feet. The stand of pine timber within the right of way has been preserved wherever possible. This route serves a heavy recreational traffic. M. S. Ross was contractor and H. L. Cooper, resident engineer.

(Continued on page 14.)

COMMISSION APPROVES CALIFORNIA ROUTES IN SYSTEM OF UNITED STATES HIGHWAYS

THE routes within California to be included in the system of United States Highways have been formally approved by the California Highway Commission. No changes were suggested in the system as originally selected by the Joint Board of Interstate Highways, of which R. M. Morton, State Highway Engineer, was a member.

The report of the board which sets up a system of main interstate trunk highways, the more important roads of the federal aid system, recently received the approval of Secretary of Agriculture W. M. Jardine and was by him submitted to the highway departments of the several states.

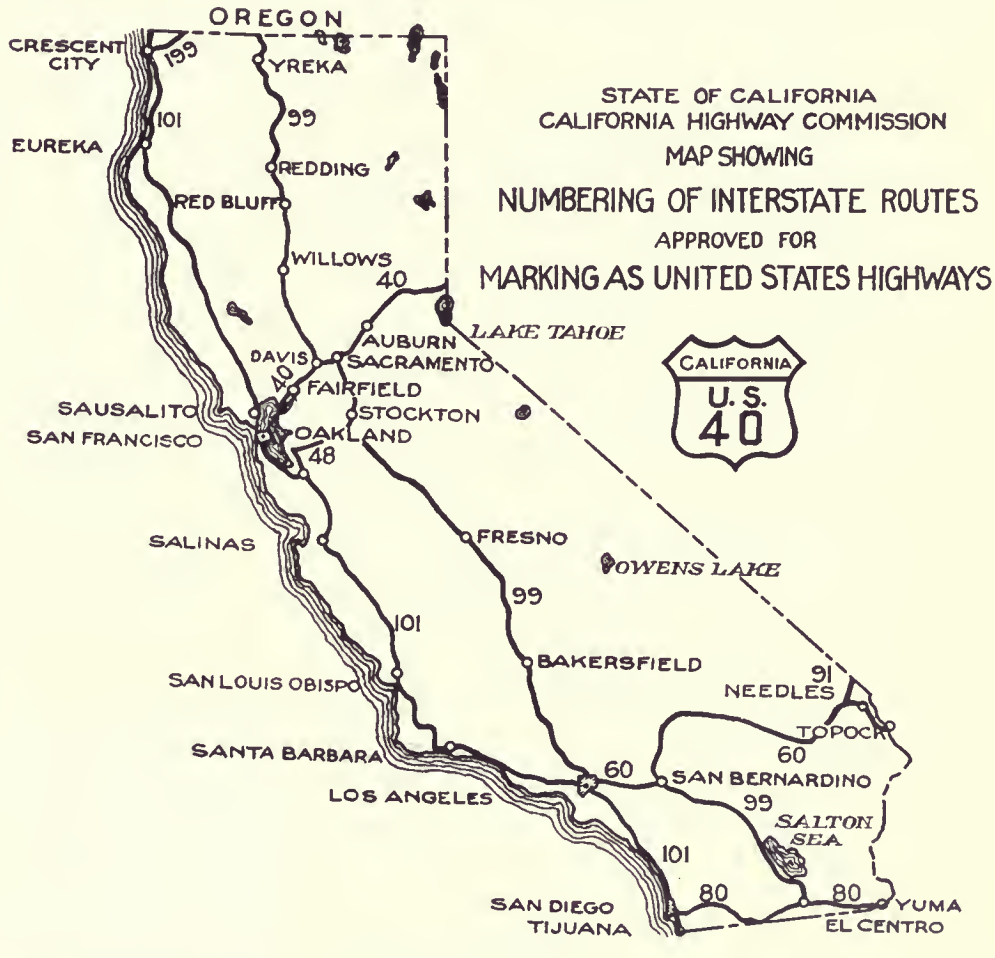
Each route has been given a number, the report also including designs for standard direction and warning signs. The purpose of the movement is to end the present confusion, the result of widely varying systems of highway marking existing in the several states.

Recommendations of Report.

The 75,884 miles of road selected for marking as United States highways includes 145 routes. Those running east and west are designated by even numbers and those north and south by odd numbers.

All of these routes eventually will be marked with the standard direction and warning signs which are of two general classes. One group, the danger and caution signs, will consist of signs of four different shapes representing as many degrees of danger. These will have a yellow background with black letters and symbols. The other group will include the standard route markers in the form of a United States shield and directional and informational signs. All signs in this group will have a white background with black letters.

The report of the joint board recommends that all of the signs, with the exception of the route marker, be used on all state highways in order to familiarize the public with the signs. The use of the United States shield as a route marker, as shown in connection with the map reproduced on this page, is to be restricted to United States highways.



Routes in California.

California is crossed by two of the north and south routes and three of those extending east and west.

Route 99 follows, in part, the route now designated as the Pacific Highway, extending southward through Yreka, Redding, Red Bluff, Willows, Woodland, Davis, Sacramento, Stockton, Fresno, Bakersfield, Los Angeles, San Bernardino to El Centro.

Route 101 follows the Redwood and Coast highways through Crescent City, Arcata, Eureka, Willits, Sausalito, San Francisco, San Jose, San Luis Obispo, Santa Barbara, Los Angeles, Whittier, Santa Ana, San Diego to Tijuana.

The Crescent City-Grants Pass connection is designated Route 199, and Route 91, which extends north and south through Salt Lake City, enters California near Needles, San Bernardino County.

The first east and west route in California is Route 40, the Victory Highway, which passes westward through the center of the nation entering California through the Truckee River canyon, thence through Auburn, Sacramento, Davis, Fairfield, Benicia, Martinez, Richmond to Oakland.

The next of the east and west routes is Route 48, which extends from Stockton to Oakland and San Jose.

Route 60, the National Old Trails, enters the state at Topock and extends westward through Barstow to San Bernardino and Los Angeles.

The most southerly route is Route 80, the Old Spanish Trail, which runs westward through Yuma, Arizona, to El Centro and San Diego.

Secretary Stresses Importance of Move.

In his letter of approval Secretary Jardine said, in part:

"This adoption of the proposals of the board will accomplish a marked advance in the highway system and building program of the country as a whole. The clear designation of important routes of travel will be a distinct advantage not only in eliminating confusion, but also in furthering systematic and continuous construction.

"Uniform marking through the system of danger signs provided should promote safety of travel, especially if it can be associated with uniform traffic regulations. The directness of the through routes will doubtless serve a very large number of our population that travel from one general section of our country to another and will facilitate that freedom of communication which more than anything else binds our states and our country in one united nation."

DIVISION REPORTS

DIVISION X.

HEADQUARTERS, SACRAMENTO.

J. C. McLEOD, DIVISION ENGINEER.

Counties of Amador, Calaveras, Alpine, Tuolumne, Stanislaus, San Joaquin, Solano, and southern Sacramento and Yolo counties.

IN ADDITION to his regular duties, Maintenance Inspector Clarence Bovey has been acting as inspection for the Divison of Architecture on the grading and graveling of 1.6 miles of roadway in the grounds of the Stoctkon State Hospital. The cooperation was gladly extended at the request of the Division.

Bids have been asked for the dredger fill at the west approach of the M street bridge at West Sacramento, and actual building of an improved approach to Sacramento from the west soon will be under way. This is a part of the general program for the improvement of the Sacramento entrances.

San Joaquin Project Completed.

The largest of the 1925 projects in Division X, the reconstruction of the state highway between Turner Station and Stanislaus River, San Joaquin County, is now completed and open to traffic, including the sections within the city of Manteca. The highway routes through this municipality were paved full width, the state and local property owners cooperating. J. F. Knapp was the contractor and C. W. Springer, resident engineer.

Some exceptionally low vialog records were made on this project, which is the division's outstanding improvement for the past year.

EQUIPMENT DEPARTMENT

R. H. STALNAKER, EQUIPMENT ENGINEER.

THE new shop at Fresno has been completed and the Fresno branch of the equipment department soon will be housed in the new building, which provides additional room and better facilities for handling the repair work of the San Joaquin Valley. Major repair work of Division VI will be handled at the new shop.

The Commission has approved an allotment of $4,000 for the installation of additional equipment at the new San Bernardino shops.

A modern paint shop has been installed at the Sacramento headquarters for the handling of paint work on state-owned vehicles operating out of Sacramento.

Wedding Announced.

The news has reached headquarters of the marriage recently of A. G. Zecher and Miss Madeline Hayes of San Francisco. The groom is foreman in charge of the sub-shop at Bakersfield. Superintendent E. S. Anderson and his assistants of Shop Six extend their congratulations.

SUPERINTENDENT HONORED

USERS of state highways in the El Dorado section, Division III, at Christmas time presented Maintenance Superintendent Harry L. Montfort with a handsome gold watch and chain, accompanied by a written testimonial of their appreciation of the improvement accomplished during the past year on the route between Placerville and the Nevada line and in the vicinity of Lake Tahoe.

The El Dorado County Chamber of Commerce, the American River Home Owners' Association, stage and resort owners, and individual citizens joined in presenting the gift.

Superintendent Montfort has been in charge of the district for the past two years and has three maintenance foremen working under his direction. The evident approval with which the people view the maintenance of state highways in El Dorado County is gratifying, indeed, to Mr. Montfort's superiors.

LOS ANGELES ENGINEER SAYS CALIFORNIA STATE HIGHWAY BRIDGES EQUAL NATION'S BEST

BRIDGES now under construction on California state highways are the equal if not superior to similar structures being built in other parts of the country; particularly is this true of the average strength of concrete in California bridges as compared with bridges elsewhere.

This opinion is expressed by H. P. Cortelyou, Engineer of Construction in the office of the Inspector of Public Works of the city of Los Angeles, which has under way an expenditure of $10,000,000 on heavy bridges and viaducts. That the city might take advantage of latest and best methods of construction, Mr. Cortelyou and Mr. Merrill Butler, Chief of Bridge Design, were sent on a six-weeks trip to study the bridge practice of eastern states. They visited Minneapolis, Chicago, Detroit, Cleveland, Buffalo, Boston, New York, Philadelphia, Washington, D. C., Pittsburgh, St. Louis, and Kansas City, in which cities they were given every opportunity, Mr. Cortelyou reports, to thoroughly inspect bridges, both completed and under construction.

California Results Not Equaled.

Writing of his trip to Harlan D. Miller, Bridge Engineer for the California Highway Commission, Mr. Cortelyou, says, in part:

> The fineness modulus or other scientific methods of proportioning are being used in only a few rare instances, and in several places its use has been abandoned. Professor Abrams himself says that it is but a means to an end and he now advocates the water cement ratio specification, under which the new Portland Cement Association Building in Chicago is being constructed with excellent results.
>
> I judge that the average strength of 1:2:4 concrete on bridges throughout the country will average about 2000 to 2200 pounds per square inch at 28 days. On the best jobs this average is about 2500 to 3000 pounds per square inch.
>
> **I will say that nowhere in the country have I seen or even heard of the equal of results which you are getting on bridges for the California Highway Commission, for I understand that you are getting an average of about 3700 pounds at 28 days. I consider this a very remarkable achievement and one for which you and your assistants can not be given too much credit.**

ON THE MALIBU JOB—A straightedge with cleats at various angles used for checking slopes on the Malibu Ranch grading contract, Division VII. This device was described in the December issue of the Bulletin.

BRIDGE DEPARTMENT NEWS

HARLAN D. MILLER, Bridge Engineer.

PLACING of the deck and railings on the great Klamath River bridge on the Redwood Highway has been begun by the contractor and early completion of the bridge may be expected.

Work has been begun on the Merced River bridge at El Portal on the Yosemite National Park highway entrance, and plans have been finished for three additional structures to be built on the Briceburg section of this important highway.

Work has started on the construction of the Carlsbad overhead crossing of the Santa Fe railroad in San Diego County. This structure of five spans of reinforced concrete will eliminate a dangerous grade crossing. W. S. Kingsbury Jr. is resident engineer.

Villa Creek Bridge Progresses.

Placing of the superstructure of the Villa Creek bridge on the Pismo line change on the Coast Highway has been begun.

In Southern California, work is nearing completion on the large San Gabriel River bridge near Whittier and on the San Juan Creek bridge near San Juan Capistrano. The Montebello subway also is nearing completion.

Three small concrete structures on the state road leading to the California Redwood Park, in Santa Cruz County, have been completed and accepted.

Driving of concrete piles for the foundation of the Willow Brook bridge near Petaluma on the Redwood Highway has been begun by the contractors.

Draftsmen in Los Angeles.

To facilitate the work of the Bridge Department in the southern part of the state, five or six draftsmen have been transferred to Los Angeles where they have quarters in the offices of Division VII. Chas. W. Jones, formerly of the Sacramento office, is in charge.

Harold J. Peacock, popular member of the headquarters staff of the Bridge Department, has resigned to accept a position with a Sacramento engineering firm.

MONTECITO RESIDENT COMMENDS DIVISION V HIGHWAY PROJECT

THE STATE highway through Montecito, immediately south of the city of Santa Barbara, recently was reconstructed to a width of thirty feet with heavy cement concrete shoulders and an asphalt concrete surfacing over the old pavement. The work was done under the direction of Division V, and traffic was maintained over the highway right of way during the period of construction.

That local residents believe a good job was done and that they appreciate the manner in which the work was supervised by the division, is evidenced by the following letter received by Division Engineer L. H. Gibson:

> "According to the local papers, you have inspected the stretch of highway recently rebuilt in Montecito, so that it is unnecessary to tell you that it may justly be considered one of the finest pieces of road in the state.
>
> In connection therewith it will, however, not be amiss to say a word of commendation regarding the painstaking manner in which the work, as a whole, was handled by your staff.
>
> The heavy through traffic, in conjunction with the local Montecito traffic, was given the utmost possible consideration, consistent with due regard for the rights of the contractor. There was no interference nor inconvenience caused to auto traffic at any time during the progress of the work.
>
> The writer resides in Montecito, close to the state highway, and daily trips to Santa Barbara warrant an expression of opinion in the matter.
>
> (Signed) A. E. Aeby."

E. B. Brown was resident engineer on this project. The Cornwall Construction Company of Santa Barbara was the contractor.

FRENCH GRAY NEW COLOR FOR COMMISSION VEHICLES

MOTOR vehicles, including trucks, operated by the Commission hereafter will be finished in a uniform color, a distinctive French gray having been approved for that purpose, it is announced by Equipment Engineer R. H. Stalnaker.

A number of cars already have been turned out by the new headquarters paint shop and within a short while all of the equipment in use in the various divisions will be repainted, and will have impressed upon each vehicle the new seal of the Commission in three colors, red, gold and black.

A transit and a winged wheel are dominant symbols of the seal which bears the latin motto: "Robur directum scientia est via fortunæ." This is translated "Energy directed by science is the highway to prosperity."

Under a ruling of the State Board of Control, other state departments will not be permitted to use the color selected by the Highway Commission.

New Paint Shop Established.

In pursuance of the new policy, a study of various painting systems was made by the Equipment Department and the use of a nitro-cellulose lacquer for all passenger cars was decided upon. For the present, an oil paint will be used on the trucks and other equipment.

A complete lacquer painting system has been installed at the headquarters shop at Sacramento and two traveling outfits also have been fitted up. These outfits are now making a tour of the several divisions, painting the passenger cars in each division as they pass through. Early in January, this work was more than half completed and in another month or six weeks, Mr. Stalnaker says, all of the passenger cars of the Commission will have been finished in the new standard color and will have the new seal and sign on the doors.

HIGHWAY NEWS NOTES

Fresno News.

RESIDENT Engineer T. W. Voss has been transferred to El Portal in connection with the work to be done on the Yosemite Highway by the Folsom Prison camp.

Norman Coote, assistant resident engineer at Bakersfield, has resigned to enter the services of a Los Angeles engineering firm.

A. N. Wakefield, chief of party on the Yosemite Highway grading project, was married recently to Miss Hostetter of Mariposa.

Division X Foreman Transferred.

Division X announces the transfer of J. H. Gates to San Andreas to take over the maintenance district formerly in charge of Foreman R. Brennan, deceased. C. L. Caine, assistant resident engineer, will take the place of Mr. Gates at Fairfield.

T. M. Joyce has been transferred from Briceburg, Division VI, to act as sub-forman under S. E. Harris, at Jamestown.

Another Packard.

The hopes of L. D. Packard that he might add to the ranks of the Bridge Department were not realized when Miss Betty Jean Packard, the second Packard, arrived recently, without even mentioning the Highway Commission.

Claude Simpson of the filing department won third prize in the Sacramento Christmas tree contest. His entry was a handsome redwood, growing in his front yard, which had been prettily decorated for the holiday season.

Commissioner Louis Everding was a visitor at headquarters recently upon the occasion of the opening of the bids for the Big Lagoon grading and bridge project, in Humboldt County.

Times and Roads Change.

It's hard for the average local citizen to realize that 40 years ago there was no such thing as a spark plug and every road was a detour.

STATE HIGHWAY FUND CONTRACTS (Bond Funds, Including Federal Aid)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE DEC. 14, 1925.						
465	VIII	Imperial	26	F, G	Imperial to Brawley	9.39	Grade and Gravel Surface	H. G. Fenton	$113,547 83	April 7, 1925	------
470	III	Nevada	38	A	Across Truckee River at Prosser Creek	------	R.C. Girder Bridge	T. H. and M. C. Polk	25,981 88	June 17, 1925	------
472	II	Tehama	7	A	Through Corning	1.00	P.C. Concrete Pavement	E. A. Burns	44,268 41	June 17, 1925	------
481	IV	San Mateo	55	A, B, C	Northerly Boundary to Kings Mountain Road	------	Guard Rail	Samuel A. Martindale	9,112 50	Sept 3, 1925	------
					AWARDED SINCE DEC. 14, 1925.						
491	VIII	Imperial	27	B	Across the Sand Hills	5.96	Grade and A.C. Pavement	Schmidt and Hitchcock	319,500 00	Dec. 30, 1925	300
492	I	Humboldt	1	J	Across Big Lagoon	1.40	Grade and Gravel Surf. Timber Trestle	Mercer-Fraser Co.	140,251 00	Jan. 18, 1925	200
					Sub-total	7.36			$459,751 00		
					PENDING AWARD.						
------	X	Yolo	6	C	Fifth Street in Washington to the M Street Bridge	0.25	Grading		18,000 00	------	90
					Total State Highway Fund Contracts Awarded and Pending Award	7.61			$477,751 00		

NOTE.—Primary construction covered by the above contracts does not include funds obligated on cooperative forest highway projects, prison road camp activities, or day labor jobs not being done under contract.

STATE HIGHWAY MAINTENANCE FUND CONTRACTS (Including Gasoline Tax Fund)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE DEC. 14, 1925.						
M-65	X	San Joaquin	4-66	A, B-A	Southerly Boundary to Turner Station	12.27	P.C.C. Pavement and Shoulders	J. F. Knapp	$329,436 79	Mar. 26, 1925	------
M-72	V	Santa Barbara	2	J	Ortega Hill to Santa Barbara	1.87	P.C.C. Pave. and Shldrs., A.C. Surface	Cornwall Construction Co.	91,503 84	May 4, 1925	------
M-74	VII	Orange	2	A	San Juan Creek to Galivan	5.59	P.C. Concrete Pavement	Jahn and Bressi	188,662 03	May 4, 1925	------
M-75	IV	Contra Costa	14	A, B	San Pablo Creek to El Ciervo	6.64	Asphalt Mac. Surf. and Widening	Kaiser Paving Co.	165,565 46	May 4, 1925	------
M-81	III	El Dorado	11	E, F	Camino to 2 miles East of Sportsman Hall	5.77	Grade and Rock Surface	Irey and Holden	75,171 58	May 20, 1925	------
M-84	VIII	San Bernardino	26	A	Santa Ana River to Redlands	5.49	P.C.C. Pave. and Shldrs., A.C. Surface	Basich Brothers Co.	157,147 54	June 3, 1925	------
M-99	VIII	San Bernardino	43	D	Big Bear Dam to Fawnskin	3.27	Grading	M. S. Ross	32,609 54	Sept. 21, 1925	------
					AWARDED SINCE DEC. 14, 1925—None.						
					PENDING AWARD—None.						

NOTE.—The above obligations charged against the State Highway Maintenance Funds do not include funds from these sources obligated for general maintenance and for specific betterments being done under day labor authorization.

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CALIFORNIA HIGHWAYS

A BULLETIN ISSUED BY THE CALIFORNIA HIGHWAY COMMISSION FOR THE INFORMATION OF ITS EMPLOYEES AND THE PUBLIC

Vol. 3 FEBRUARY, 1926 No. 2

SHOVELS CONQUER ORTEGA HILL—A wide, safe highway soon will cross this historic elevation a few miles east of Santa Barbara. The views give an idea of the magnificent panorama of ocean and shore awaiting motorists. *Above*, looking westward toward Santa Barbara, fill for new highway at right; *below*, looking eastward over Summerland with its oil wells in the surf. See article and cut on page 3. (Photo by Division V.)

In this issue: CONCRETE MIXING TESTS—TIME AND CAPACITY STUDIES.

CALIFORNIA HIGHWAYS

HARVEY M. TOY, Chairman;

N. T. EDWARDS and LOUIS EVERDING, Commissioners.

ROBERT M. MORTON, State Highway Engineer.

W. F. MIXON, Secretary.

We are pleased to permit publication of any of the matter contained herein or to loan cuts, and this privilege is extended newspapers and periodicals without restrictions.

FRANK B. DURKEE - - - Editor

P. O. Box 1103, Sacramento, California.

Vol. 3 FEBRUARY, 1926. No. 2

CALIFORNIA HIGHWAY DEPARTMENT

CALIFORNIA HIGHWAY COMMISSION

HARVEY M. TOY, Chairman, San Francisco

N. T. EDWARDS, Commissioner, Orange

LOUIS EVERDING, Commissioner, Arcata

R. M. MORTON, State Highway Engineer, Sacramento

PAUL F. FRATESSA, Attorney, San Francisco

W. F. MIXON, Secretary, Woodland

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FRED J. GRUMM, Engineer of Surveys and Plans

HARLAN D. MILLER, Bridge Engineer

C. S. POPE, Construction Engineer

R. H. STALNAKER, Equipment Engineer

G. R. WINSLOW, Maintenance Engineer

C. L. McKESSON, Materials and Research Engineer

BEN H. MILLIKEN, Superintendent of Prison Road Camps

HERMAN B. WEAVER, Chief Accountant

LOWELL R. SMITH, Purchasing Agent

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H. S. COMLY, Division II, Redding

F. W. HASELWOOD (Acting), Division III, Sacramento

J. H. SKEGGS, Division IV, San Francisco

L. H. GIBSON, Division V, San Luis Obispo

J. B. WOODSON, Division VI, Fresno

S. V. CORTELYOU, Division VII, Los Angeles

E. Q. SULLIVAN (Acting), Division VIII, San Bernardino

F. G. SOMNER, Division IX, Bishop

J. C. McLEOD, Division X, Sacramento

General Headquarters, Fifth Floor, Forum Bldg., Sacramento

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AMERICAN BANKERS BODY ENDORSES FEDERAL AID

FEDERATION OF LABOR IN NATIONAL CONVENTION ALSO FAVORS POLICY.

THE highway building program of the United States, as established by the Federal Highway Act, has received the unqualified support of both the banking and organized labor interests of the country.

The American Bankers Association during its recent annual session went on record against any cessation of the government's cooperative policy with the states in the construction of interstate roads, until the system as now laid out is complete. The support of the federal aid policy was expressed briefly in the following resolution:

> "It is the judgment of this convention that the federal government should continue its cooperative policy with the several states in road construction until such time as the interstate system of highways laid out by agreement between the federal government and the states has been completed."

Labor Takes Action.

Following the action of the bankers, the American Federation of Labor, also in annual session, adopted resolutions urging the completion of the highway system undertaken by the states with the support of the federal government.

In its resolution the labor body expressly stated that

> "the federal government should continue in this work with the states until such time as the system is completed, according to the agreement heretofore entered into."

"It is interesting to note," says a statement issued by the American Association of State Highway Officials, "that support for the government's present policy in road development is backed by two classes of income taxpayers, since there are large numbers in the ranks of organizerd labor, as well as among bankers, who are contributors to the government's internal revenue from which funds for road building are appropriated."

Uncle Ezra is a hundred, he hasn't any scars,
He never rides in autos, he sticks to trolley cars.

FEBRUARY 1926

California Highways

VOL. 3 No. 2

Relocation of the Highway Over Historic Ortega Hill

RELOCATION of the state highway over historic Ortega Hill is the second reconstruction project to be undertaken by the California Highway Commission in Santa Barbara County, east of the city of Santa Barbara. Work now under way will eliminate for all time the steep and winding grades over this elevation which, for generations has impeded traffic on the El Camino Real. The section under improvement joins the recently widened pavement through Montecito.

The general location of the highway, which, in this vicinity, was a county road in the days before the state system was established, is limited by the comparatively narrow bench extending southeasterly along the coast at the foot of the steep Santa Barbara Mountains. When taken over by the state, the existing road followed more or less closely the route established by the early Spaniards.

Need for Change Evident.

It is not surprising, when demands of an increasing motor vehicle traffic are considered, that there is need for changes in grade and alignment. A number of such improvements, some quite radical, as in the case of Ortega Hill, some minor, are being made or are planned for the future.

The present highway crosses Ortega Hill at a saddle about a half mile back from the ocean. It is narrow and crooked with steep bluffs above and below the road, and grades up to a maximum of 8.80 per cent. **The new location follows an almost straight line (2400-foot minimum radius) across the bluff directly facing the ocean. The maximum grade will be reduced to 6.40 per cent and the distance cut about 700 feet.**

When open to traffic, the view of the Santa Barbara Channel to be obtained from this new summit, both east and west, will be one of the most beautiful along the Coast highway. For this reason, instead of passing through the hill on a thorough cut, as would ordinarily have been done, the grade has been established high enough to permit "daylighting" of the outer bank, that is, its entire removal on the ocean side.

Public to be Benefited.

The old location was so poor, and the traffic to be provided for so heavy, that the old relocation adopted is well justified, particularly in view of increasing property values. The new highway crosses several oil wells and a number of residences and other buildings had to be moved. The local inconvenience, however, is more than compensated for by the advantage to the general public.

In addition to Ortega Hill, a bad situation exists, immediately to the east, through the town of Summerland. The street on which the 15-foot pavement was placed has a width of only about 30 feet. On one side are business buildings, on the other the tracks of the Southern Pacific Railroad, while traffic through this congested section often exceeds 4,000 vehicles per day.

Condemnation Suits Necessary.

A new right of way has been secured by taking over a residence street one block back from the present location. A width of 80 feet was acquired by purchasing frontages of adjoining lots and moving several buildings.

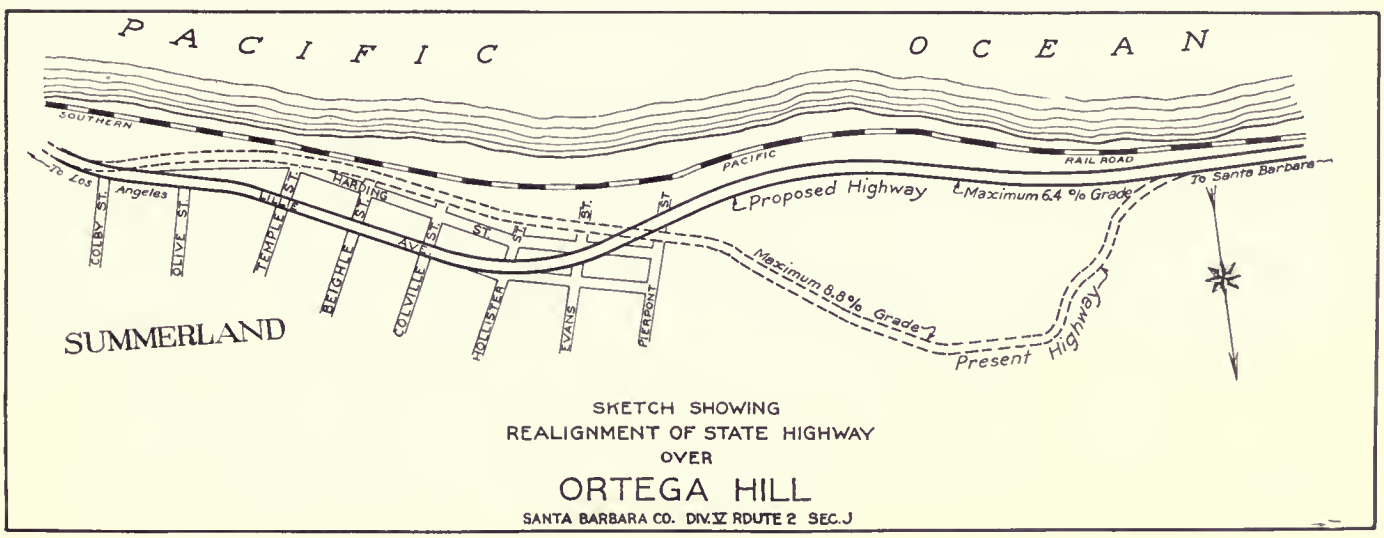
Condemnation suits had to be filed, however, before rights of way could be obtained through Summerland and also over Ortega Hill. Originally there were nearly 200 defendants in these suits but through friendly negotiation most of the needed property has been purchased without court trials. It is hoped the compensation to be paid by the state in each instance can be determined by similar action.

An order of possession from the superior court of Santa Barbara County has permitted the work to proceed, and McCray Brothers, of Los Angeles, the contractors, have made rapid progress with the grading over Ortega Hill. It will not be long before the new highway will be opened to traffic, and the old road returned to the jurisdiction of Santa Barbara County.

Hill Named for Early Spaniard.

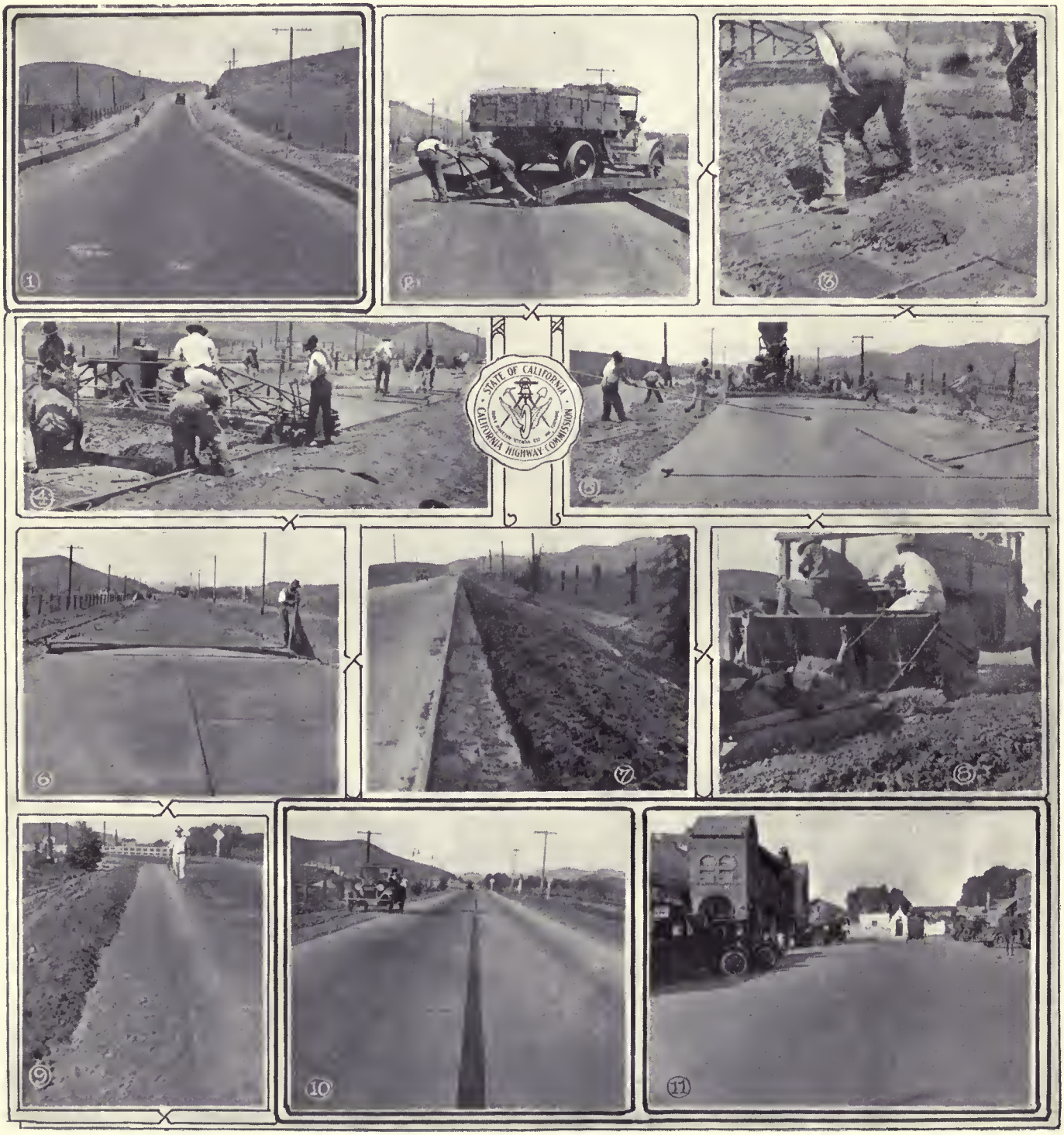
Added interest will be taken in this project by those who delve into the romantic past of California, because Ortega Hill is understood to have been named for Captain Jose Francisco Ortega, often called the "Kit Carson" of early Spanish expeditions into California. He was active in colonization work for thirty years and died near Santa Barbara February 3, 1798.

This splended reconstruction project is being financed with gasoline tax funds. It is under the direction of Division V; L. H. Gibson, division engineer. E. B. Brown is resident engineer.



SKETCH SHOWING
REALIGNMENT OF STATE HIGHWAY
OVER
ORTEGA HILL
SANTA BARBARA CO. DIV. V RDUTE 2 SEC. J

A "SECOND STORY" GAS TAX JOB IN PICTURES



GALIVAN-SAN JUAN RECONSTRUCTION PROJECT, ORANGE COUNTY, DIVISION VII—(1) Headers in place along old fifteen-foot four-inch pavement for placing new 20-foot slab with minimum five-inch center and nine-inch edge; (2) turntable to turn trucks without interference with beader boards; aggregate dumped directly into mixer; (3) placing concrete; note steel bars to reinforce new slab over edge of old pavement; (4) laying pavement; mechanical tamper in operation; (5) finishing the surface; note many operations required to provide smooth riding surface; (6) placing heavy moist burlap, first step in curing; after initial set of pavement, earth dykes are constructed and pavement flooded with water; (7) two-foot trench, five inches deep, cut along edge of new pavement and ready for placing rock border; (8) spreading and dragging rock border in single operation; (9) the completed rock border; (10) a traffic stripe painted down the center joint of the new pavement; (11) new pavement through San Juan Capistrano; historic San Juan Mission at end of the street. (Photos by Division VII—Jahn and Bressi, contractors.)

Concrete Mixing Tests—Time and Capacity Studies

By C. S. Pope, Construction Engineer, and C. L. McKesson, Materials and Research Engineer.

DETERMINATION of the time required for mixing and the effect of time of mix upon the strength of concrete has been the subject of numerous studies by research agencies; some of the test series have been of rather extensive proportions. In the tests made by the California Highway Commission, and herein described, the time of mix is involved only in an incidental way, the primary consideration being the capacity of concrete mixers.

The Standard Specifications of the California Commission define the capacity of a concrete mixer in the following terms:

> "The total volume of all mixed materials used per batch shall not exceed the manufacturer's catalogue rated capacity of the mixer or a rating to be fixed by the engineer based on measurement of the water level capacity of the drum."

The time of mixing, after all ingredients are placed in the drum and before discharge of any portion of the batch, is specified as one minute for all concrete except that to be used in reinforced structures. Concrete for use in reinforced structures is mixed 1½ minutes.

It occasionally happens that the capacity of the mixer is the limiting element in the contractor's equipment and in such cases it is economically desirable that the mixer be loaded to the maximum capacity at which it will operate efficiently. Sometimes maximum capacity is desirable to make the size of batch fit transportation equipment.

California Experiments Described.

This latter consideration led to the first series of experiments described herein, made in June and July, 1924.

The mixer in use was a Koehring 32 E paver. The normal rated capacity of this mixer is 32 cu. ft. of mixed concrete, the maximum capacity, according to the manufacturers, is 36 cu. ft. How closely this rating checks the results of our tests will be apparent later. On this project it was found that a 10-sack batch (45 cu. ft. of mixed concrete) was desirable, if thorough mixing could be had, due to capacity of batch boxes on industrial cars.

In the earlier stage of the work, 10-sack batches were run, the time of mix being increased from 1 minute to 1½ minutes to compensate for the additional size of batch. The drum and bucket were large enough to carry the oversized batch without wastage.

The test series run to check up on the capacity of the mixer consisted of the casting and testing of 48 6x6-12" prisims. Four prisms were cast from each batch, two being taken from the front of the batch or the portion first discharged from the mixer, and two from the back or last of the batch.

The twelve batches sampled were as follows:

3 10-sack batches, 1-minute mix, 12 specimens.
3 10-sack batches, 2-minute mix, 12 specimens.
3 8-sack batches, 1-minute mix, 12 specimens.
3 8-sack batches, 2-minute mix, 12 specimens.

The mix (approximately 1-2-4) was uniform throughout and water was fairly well regulated, although the mix was somewhat wetter than our present practice. Slump tests were made on concrete taken from the front and back of each batch. In all cases the slump of concrete from the front of the batch was greater than from the back.

Except for the 2-minute, 8-sack batches, there was a noticeable surplus of mortar in the front of the batch, and a corresponding deficiency in the back. The 2-minute, 8-sack batch was uniformly workable throughout.

The results of the tests are shown in Table 1 and are graphically shown in figure 1.

The 1-minute mix with an 8-sack batch was found in this test to have highest compressive strengths although, as noted above, the 2-minute mix had somewhat better workability and uniformity. The 8-sack batch corresponds with the manufacturers maximum capacity rating and the tests showed conclusively that the mixer had been honestly and accurately rated by its designing engineers.

The outstanding feature of this test was the failure of additional time of mix to compensate for the overloading of the mixer. It

(Continued on next page.)

TABLE No. 1.

TIME OF MIX AND SIZE OF BATCH.

Made on X-Sac.-4-B.

July 10-11, 1924.

11-day and 28-day specimens from front and back of each batch.
Specimens 6" x 6" x 12" tested for compressive strength.
1:2:4 Mix.

Batch No.	Time of mix min.	Size batch sacks	Size batch cu. ft. conc.	Slump Front	Slump Back	Strength 11 days Front	Strength 11 days Back	Batch Aver.	Strength 28 days Front	Strength 28 days Back	Batch Aver.	Remarks (F) Front of batch (B) Back of batch
1	1	10	45	1½	1⅜	1963	1760	1861	3036	3030	3033	(F) Plenty of mortar (B) Very rocky
2	1	10	45	⅞	1½	1890	1540	1715	2540	2862	2701	(F) Plenty of mortar (B) Very rocky
3	1	10	45	1⅜	⅝	1660	1840	1750	2527	2585	2556	(F) Plenty of mortar (B) Rocky and hard to compact
Group average						1837	1713	1775	2701	2826	2763	
4	2	10	45	3½	⅜	1480	1340	1410	2227	2318	2272	(F) Surplus of mortar (B) Extremely rocky, almost impossible to compact
5	2	10	45	1¼	¾	1730	1690	1710	2735	2721	2728	(F) Surplus of mortar (B) Very rocky
6	2	10	45	⅞	⅜	1710	1760	1735	2950	2830	2890	(F) Plenty of mortar (B) Rocky
Group average						1640	1597	1619	2637	2623	2630	
7	2	8	36	2	1¾	2030	1930	1980	2900	2544	2722	Plenty mortar front and back
8	2	8	36	2¼	2	1910	1910	1910	2722	2450	2586	Plenty mortar front and back
9	2	8	36	2½	1¾	1980	1930	1955	3227	3066	3146	Plenty mortar front and back
Group average						1973	1923	1948	2949	2686	2818	
10	1	8	36	3	¾	2406	2320	2360	3033	3330	3181	(F) Plenty of mortar (B) Lack of mortar
11	1	8	36	1½	¾	2540	2580	2560	3458	3219	3338	(F) Plenty of mortar (B) Lack of mortar
12	1	8	36	2¼	¾	2160	2110	2135	3111	3016	3063	(F) Plenty of mortar (B) Lack of mortar
Group average						2367	2336	2351	3201	3188	3194	

will be noted that the 2-minute mix in each instance gave slightly lower average strengths than the 1-minute mix. No reason is apparent as to why this phenomena should have occurred, but the *test did show conclusively that this mixer was properly designed to produce thorough mixing in one minute as specified so long as the batch is within the rated capacity.*

Results Compared.

It is interesting, in the consideration of time of mix, to make some comparisons of the results of these tests with tests made by Professor D. A. Abrams and reported in a paper presented to the American Concrete Institute in June, 1918.

The Abrams tests included a large number of different mixtures and consistencies and an analysis of his report indicates that time of mix does not bear a constant relation to strength for different mixtures and consistencies. Curves which he presented, as drawn, indicated a general increase of strength with increase in mixing time up to 10 minutes. As the tests made by the California Highway Commission involved only paving mixtures of normal consistencies, a comparison is made in Table 2 with the results obtained by Professor Abrams on similar concrete.

Professor Abrams' tests and the California tests in Table 1 were made on concrete of similar mix and consistencies, but Professor Abrams in his work, used a 3½ cu. ft. Smith Mixer, while California experiments were made with a paving mixer having 10 times that capacity. It may be a mere coincidence that in all of these tests, by Professor Abrams and by the California Highway Commission, there is a slight drop in strength between 1-minute and 2-minute mix. It is also possible there may be some segregation during the second minute of the mix. On this point the writers do not care to venture an opinion. Figure 1 shows the relation of time of mix to compressive strength as brought out in these tests.

Some other tests made by Professor Abrams on concretes of richer and leaner mixes and with wetter consistencies showed in some cases increases between one and two minutes, but our tests and those by Professor Abrams indicate that for 1-2-4 concrete of normal consistency no additional strength may be expected from the second minute of mixing.

CONCRETE MIXING TESTS — Fig. 1

SIZE OF BATCH AND TIME OF MIX

USING A KOEHRING 32E MIXER

SIZE OF BATCHES
10 SACK = 45 Cu. ft. CONC.
8 SACK = 36 Cu. ft. CONC.

—●— = Average For Group

SPECIMENS 6"x6"x12"
MIX 1-2-4
CURED IN WATER

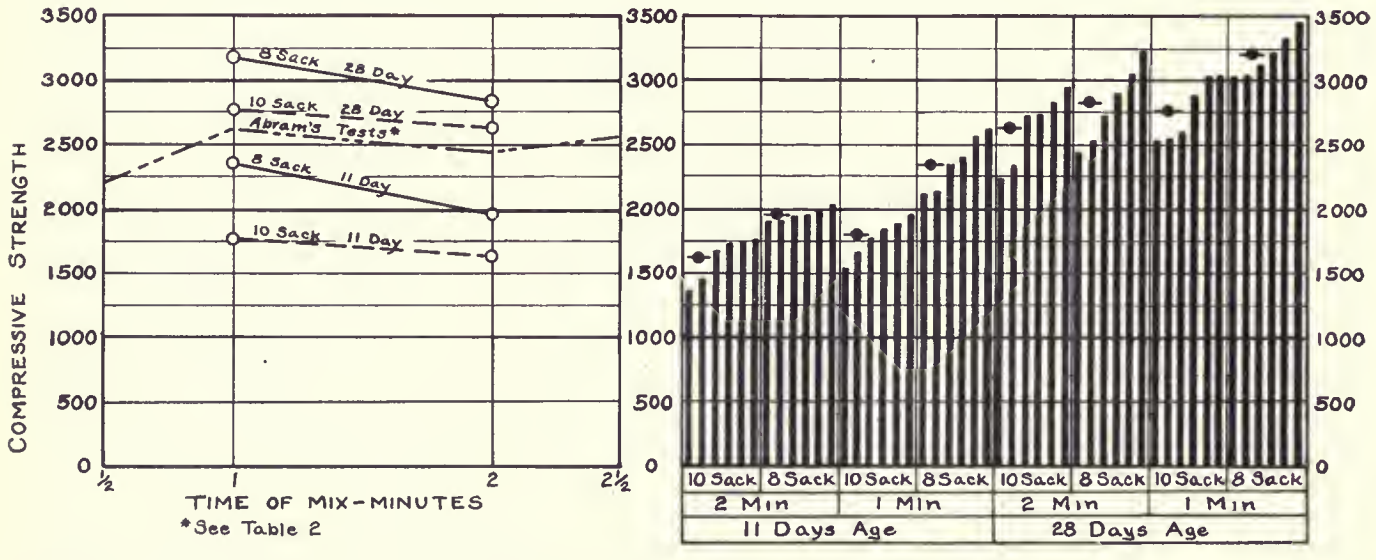


TABLE No. 2.

Comparison of Tests by Professor Abrams with those made by California Highway Commission.

	Water Cement Ratio	Mix	Mixing Period Mins.—Comp. Str. lbs. per sq. in. 28-day tests ½ Min.	1 Min.	2 Min.	5 Min.	10 Min.
C. H. C. 10-sack batches in 8-sack mixer	Approx. 80	1-2-4		2763	2630		
C. H. C. 8-sack batches in 8-sack mixer	Approx. 80	1-2-4		3194	2818		
Abrams tests*	80	1-4	2060	2520	2300	2900	2860
	.725	1-4	2210	2780	2800	3520	2930
	.655	1-4	3180	3750	3440	4020	4370
Abrams tests**	.81	1-4	2060	2320	2310	2730	2380
	.91	1-5	1490	1670	1370	2340	2600
Average C. H. C. tests				2978	2724		
Average Abrams tests			2200	2608	2444	3100	3028

*Effect of time of mixing on strength of concrete by Duff A. Abrams, (Table 7), paper before American Concrete Institute, June, 1918.
**Table 8. Same paper.

Additional Tests.

Another mixer test was recently completed for the purpose of verifying the manufacturers rating and of determining the effect of an oversized batch.

The recent test was made on a 21 E Rex Paver. This mixer is rated on the basis of a 5-sack batch for a 1-2-4 mix.

Seventy-seven 6" x 12" cylinders were cast from 5- and 6-sack batches on a paving job. The specimens were cured in the laboratory under standard conditions and tested at 28 days. The batches were measured in a central proportioning plant in which all materials were proportioned by weight. Corrections were made for moisture in aggregate and amount of water was well controlled. The time of mixing in these tests was one minute after all materials were in drum. The mixer drum was in first-class condition as to blades and buckets. The drum held the 6-sack batch without slopping over.

The work was distributed over three days to secure average conditions and to equalize the possible effect of variations in

Sir

temperature of mixing water and air. An equal number of 5- and 6-batch specimens were cast during forenoons and afternoons.

The results of 28-day tests of these specimens are shown in Table 3 and in figure 2.

TABLE No. 3.

CONCRETE MIXING TESTS.

Effect of Size of Batch in a Rex 21 E Paver.

Mix 1:1.65:3.8 (6 sacks per cu. yd. concrete).

	Five-sack batch				Six-sack batch			
Date	Time of day	Slump	Str., lbs. per sq. in. 6" x 12" Cyl.	Group average	Time of day	Slump	Str., lbs. per sq. in. 6" x 12" Cyl.	Group average
Nov. 23	A.M.	1¼	3844		P.M.	⅝	3925	
		½	3619			¼	3796	
		⅞	4272			¾	3626	
		1½	4128	3966		1⅜	3637	3737
Nov. 27	P.M.	⅞	3918*		A.M.	1⅜	4051	
		¼	4394			1⅞	4051	
		2	4456			¾	3659	
		1⅛	4833			1½	4486	
		1½	4324			½	3848	
		1⅛	4342			¼	4338	
		¾	4342			1⅞	4021	
		1¼	5316			1½	4003	
		⅝	4748			1	3368*	
		½	4442			1⅛	3541*	
		⅞	4726			⅞	4604	
		⅞	4187			1½	4416	
		1¾	4988			¾	3774	
		¾	4770			1	4235	
		1½	3738*			1¼	4360	
		⅝	4512			1¼	4231	
		⅝	5445			¾	4268	
		⅝	4427	4641		¾	4073	4150
Nov. 28	A.M.	1⅝	5670		P.M.	1⅛	4678	
		1	4692			¾	4818	
		¾	4512			2	4357*	
		1¼	4242			1¼	4364*	
		1¾	4353			2	4644	
		1	4405			¾	4593	
		1¼	4796			½	5283	
		½	4342			½	5729	
		1	3792*			⅞	5441	
		¾	3726*			¼	5253	
		½	5751			¾	4858	
		1	4962	4772				5032
Av. 30 5-sack specimens				4595	Av. 29 6-sack spec.			4368

*Low breaks. Not included in averages.

From these tests it appears that the mixer was properly rated by the manufacturers as having a 5-sack capacity on 1-2-4 concrete and that an oversized batch results in a decreased average strength.

The studies so far completed seem to indicate that any increase in time of mix for any mixers now in common use between one minute and some undetermined time more than two minutes and less than five minutes is of no particular value so far as increase in strength is concerned.

Professor Abrams' studies indicate that there is a slight increase in strength of concretes due to increased speed of rotation of mixers from 15 R. P. M. up to 30 R. P. M. and it may be that better design of the internal mechanism of mixers will result in a decreased time of mix.

It must be borne in mind, however, that any decrease in mixing time would require a re-arrangement of the whole line of supply by which the mixer is fed.

Construction Department Practice.

The modified standard practice of the Construction Department at this time with regard to mixer capacities is as follows:

(1) Preliminary capacity rating is computed by measuring the water level capacity of the mixer in the position in which it is to run and adding thereto 1/3 to ¼ of the capacity of the pick-up blades. The volume in cubic feet divided by 4.5 gives the number of sacks required for Class A concrete.

(It is to be noted that if the mixer is to be operated on a grade, the water level measurement will be decreased.)

(2) The mixer must carry the concrete without slopping over when operated on any grade on which it may be used.

(3) The spreader bucket must hold the concrete without spilling, leaking or overloading and without segregation of stone.

(4) With loaded bucket at the end of the boom the mixer must be perfectly stable.

TEST

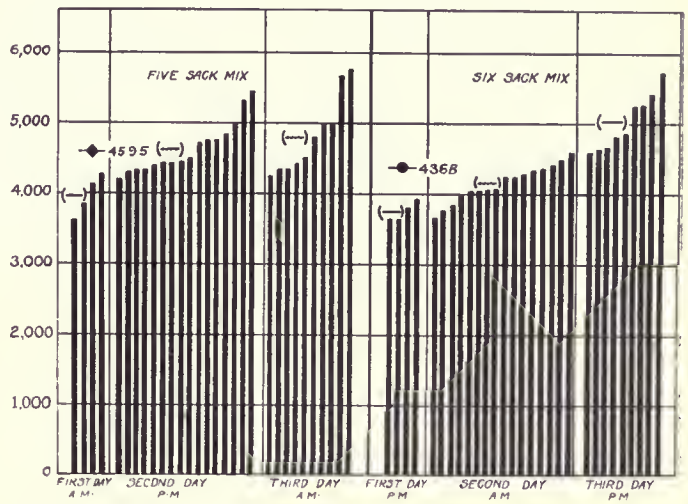
CONCRETE MIXER CAPACITY

Effect of Size of Batch on Compressive Strength Using A Rex 21E Paver.

Fig. 2.

Individual Breaks Of 6"x12" Cylinders Grouped For Each Day In Order Of Relative Strengths.

(—) = Average strength daily groups.
● = " " 5 Sack Batches.
◆ = " " 6 Sack Batches. Specimens Tested at 30 Days



(5) The mixer shall be charged with such amounts and operated in such a manner and for such a time that the concrete produced will be the strongest which can be obtained from the materials and the proportions used.

The requirement of paragraph 5 modifies all other requirements and is the true basis on which all mixers are rated in case of a controversy.

The field tests described were conducted under the supervision of Mr. Earl Withycombe, Assistant Construction Engineer, with the cooperation of field engineers.

Colm pulled out his pistol and put it in Rosenstein's face.

Just as he was about to fire, Rosenstein asked: "How much do you vant for the gun?"

Colm, in telling the story said: "And how could I kill a man ven he was talking business?"

RECONSTRUCTION IN SANTA CRUZ COUNTY—Blast in connection with rebuilding of the state road leading to the California State Redwood Park. (Photo by H. W. Schreiber.)

SECOND SAN JOAQUIN COUNTY PROJECT COMPLETED

MANTECA
STATE OF CALIFORNIA
CALIFORNIA HIGHWAY COMMISSION
STATE HIGHWAY CONTRACT No M-65
STANISLAUS RIVER TO TURNER STATION
COST $258,535.00 from GAS TAX and FEDERAL AID FUNDS

MANTECA, SAN JOAQUIN COUNTY, is proud of its new full width concrete streets recently completed in cooperation with the state and of the new concrete pavement extending north and south on the state highway. This was the major reconstruction project of the past year in Division X.

WHEN the state highway system was first layed out, some eighty miles in San Joaquin County already had been improved with various types of surfacing, asphalt macadam predominating. These improved roads were accepted as state highways and came under state maintenance with the result that only limited funds were expended within the county for primary construction.

These early pavements are now becoming inadequate for the increased traffic of the present and their reconstruction is being undertaken. Funds for this purpose were not available prior to the enactment of the gasoline tax law.

The second of these reconstruction projects recently was completed by Division X. It is a section on the valley route between Stanislaus River and Turner Station in the southern part of the county. South of Manteca, 2.67 miles of 15-foot concrete pavement was widened to 20 feet with flush concrete shoulders, 7 inches thick. The remainder of the project, 8.88 miles, was improved with a standard cement concrete pavement 20 feet wide with edges and center thickened to 9 inches. The minimum thickness is 6 inches.

County Cooperates.

A considerable part of the right of way on this section, as originally accepted from the county, had a width of only 40 feet. Homes and other improvements, including irrigation ditches, had been planned to conform to this altogether too narrow width.

Material assistance in furthering the project was extended by the county which secured and deeded to the state additional property to provide a uniform right of way of 60 feet. Fences, ditches, pole lines and buildings had to be moved, but in nearly every case this was agreed to in a friendly spirit because of the general recognition of the necessity for a wider highway.

After the clearing of the right of way, the asphalt macadam surfacing was removed and piled to one side for later use in the construction of shoulders. A new roadbed 30 feet in width was graded for the placing of pavement. The rock in the former surfacing provided a shoulder on either side of the new pavement with a minimum width of two feet. In many places it is as wide as five feet.

Full Width Through Manteca.

Through the municipality of Manteca, the commission paved a strip 20 feet in width on both the north and south and east and west state highway routes. Property owners completed the work to the curb line providing a paved street with a width of 44.5 feet of high class pavement.

Division X is expecting the Manteca project to compare favorably with other similar work throughout the state, when a compilation of vialog and strength tests for 1925 pavements is completed by the construction department.

J. F. Knapp of Turlock was the contractor. C. W. Springer was resident engineer for the state. The project cost approximately $278,000.

RANCH OWNER THANKED FOR DEDICATING RIGHT OF WAY

FOR nearly twenty miles the coast highway in San Diego County passes through the Santa Margarita ranch properties of Jerome O'Neill of Oceanside. At the approaches to San Mateo and San Onofre creeks are sharp turns and steep grades which are being eliminated by a relocation of the highway.

New rights of way for a line change at these points and for improvement of the alignment at other places were dedicated by the owner without cost to the state. His cooperation in bringing about this important betterment is appreciated by the Commission, and, at a recent meeting, Secretary Mixon was directed to send Mr. O'Neill the following letter of thanks:

Mr. Jerome O'Neill, January 20, 1926.
Oceanside, California.
My dear Mr. O'Neill:

The fact that you have dedicated a right of way for state highway purposes through your property, approximating 20 miles in length, was brought to the attention of the California Highway Commission at a recent meeting in Los Angeles.

Your valued cooperation with the Commission in eliminating many dangerous points by permitting realignment over the present road, can only result in a great deal of benefit to the traveling public, as well as to conserve life, limb and property.

The Commission thoroughly appreciates the splendid cooperation you have given in establishing the location of a highway on good engineering lines.

Again expressing appreciation of your cooperation, we remain,

Yours very truly,
CALIFORNIA HIGHWAY COMMISSION,
By W. F. Mixon,
Secretary.

NOTE.—Mr. O'Neill died in Los Angeles on February 17th after an extended illness.

CONTRACTORS APPROVE USE OF PRISONERS ON ROADS

FOLLOWING an address by Julian H. Alco of San Francisco, a member of the State Board of Prison Directors, the Contractors Association of Northern California at its recent annual convention adopted resolutions approving the use of prison labor on state highways. Alco explained in detail the law under which the road camps are operating, particularly the pay feature added by the legislature of 1923. The contractors expressed accord with the point of view of the prison directors who favor the prison camp system.

Resolutions Adopted.

Resolutions adopted approving establishment of camps under the direction of the California Highway Commission are as follows:

WHEREAS, It has been vividly pointed out in the able address to this convention by Mr. Julian H. Alco, member of the California State Board of Prison Directors, that a great number of the inmates crowded in our state prisons are misguided youths rather than hardened criminals and that their preparation for return to useful lives in society rather than their punishment will best conserve the interest of all; and

WHEREAS, The plan has been worked out in California whereby deserving prisoners are given an opportunity for training in useful work in road camps which have been established under the direction of the California Highway Commission for a few months prior to their discharge; now, therefore, be it hereby

Resolved, by the Contractors Association of Northern California in convention assembled this nineteenth day of December, 1925, that this association approve of a limited use of state prisoners in highway construction camps; and be it further

Resolved, That the secretary of this association be and is hereby instructed to transmit a copy of this resolution to Mr. Julian H. Alco and to Mr. R. M. Morton, State Highway Engineer of California.

COMMISSION ENGINEERS ON HIGHWAY BODY COMMITTEES

THE American Association of State Highway Officials, through its Washington office, has announced the appointment of standing committees for 1926. The California Highway Commission is represented by appointments to seven of the committees, as follows:

R. M. Morton, state highway engineer, Committee on Design; Harlan D. Miller, bridge engineer, Committee on Bridges and Structures; C. L. McKesson, materials and research engineer, Committee on Non-bituminous Testing Problems; E. T. Maddock, testing engineer, Committee on Bituminous and Chemical Testing Problems; Thomas E. Stanton, Jr., assistant state highway engineer, Committee on Maintenance; C. E. Malm, accountant, Committee on Accounting; Russell H. Stalnaker, equipment engineer, Committee on Equipment.

Committees of the association are engaged in studies of problems of highway building. Results of their investigations are reported upon at the annual conventions of the association and disseminated to highway departments of all the states.

A contractor who professed to be very fond of children became very angry because some little fellow stepped on a new pavement before it was dry.

His wife rebuked him. "I thought you loved children," she said.

"I do in the abstract, but not in the concrete," he replied.

LAYMAN'S DESCRIPTION OF A ROAD BUILDER'S PLAYTHING

(From an article by Al G. Waddell in the San Francisco Chronicle.)

SINKING its fangs deep and clamping its great jaws, the huge monster reared its head. There was a vicious growl, followed by a succession of grunts as the enormous brute wheeled around and vomited earth and stone into the waiting motor truck. The great animal snapped its jaws like an Allosaur licking its chops. There was a prolonged hissing, broken at intervals by wicked snorting, and again the fangs ground deep and the jaws locked.

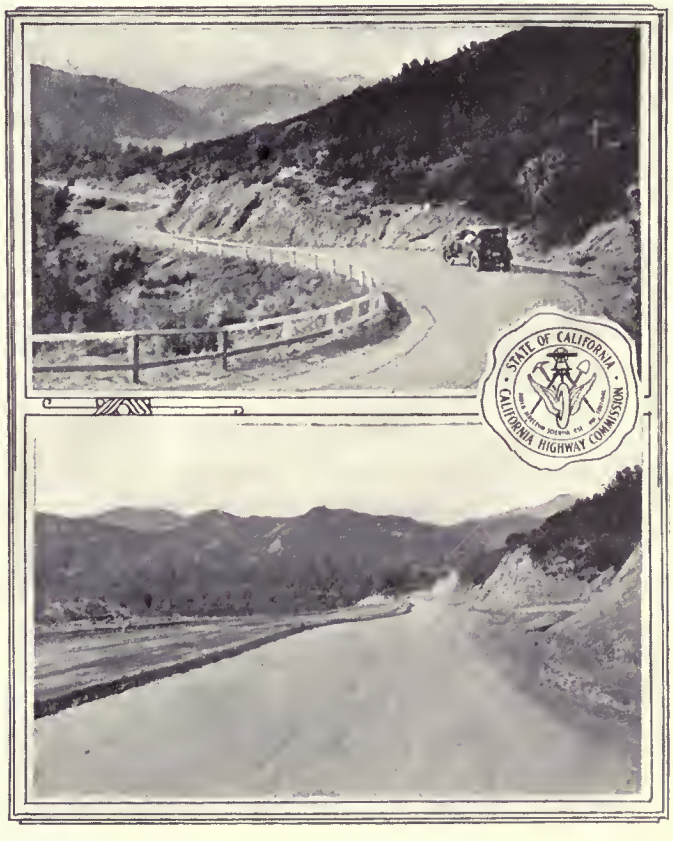
Three times, the steel mastodon ground its teeth into the mountain side. Three times, the huge mouth opened over the motor truck. Then, the truck was filled to overflowing with almost five yards of "muck."

The monster rested for a period, throbbing with the joy of conquest and defiantly belching forth steam and smoke and fire. It was like mighty Moloch of the Amalekites, chuckling with glee.

Mr. Waddell's clever pen picture of a steam shovel in operation was written after his recent visit to the Merced Canyon prison camp operations in Division VI. He has made a steam shovel a living, breathing thing. Engineers will admire his ability as a writer fully as much as he evidently admires the modern road building machinery operated by the California Highway Commission.

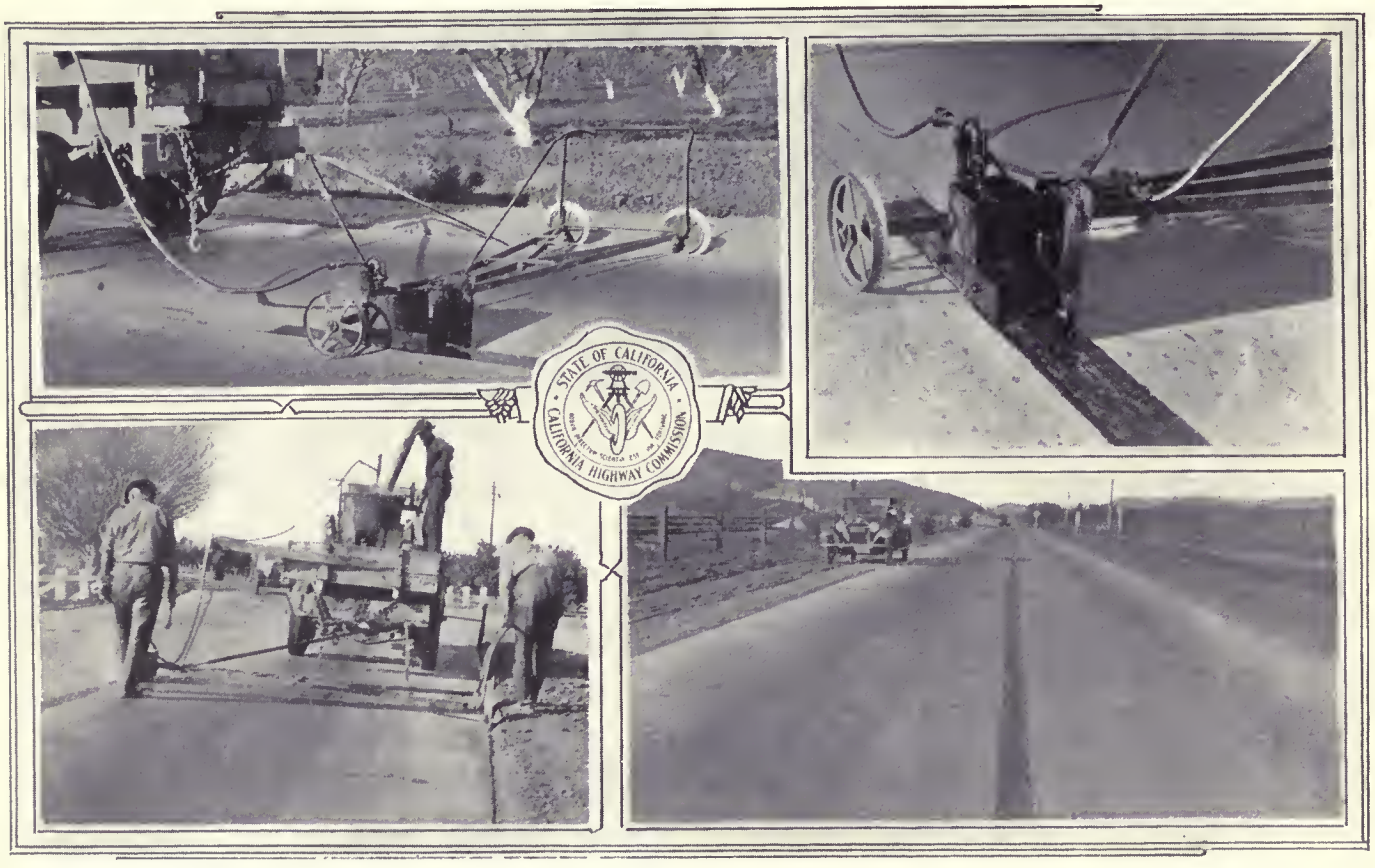
Fire Prevention Slogan.

"A cigarette may be down, but it's never out—till you step on it."



BORDERLAND HIGHWAY STRAIGHTENED—Before and after views between Pine Valley and Laguna summit, San Diego County, where forces of Division VII have widened and straightened sections of the San Diego-El Centro state highway. The lower view shows the improved highway.

DIVISION VII DEVELOPS NEW TRAFFIC LINE MARKER



SOUTHERN DIVISION DEVELOPS NEW FORM OF TRAFFIC GUIDE MARKER—*Upper left*, method of attaching marker to truck. *Upper right*, spray box and runner, together with hose and nozzle support. *Lower left*, outfit under way showing details of operation. *Lower right*, stripe painted on new 20-foot concrete pavement. (Photos by Div. VII.)

By I. S. Voorhees, Assistant Maintenance Engineer.

MAINTENANCE forces are finding need for an efficient means for marking traffic lines on highways. Experience has shown that a stripe that clearly indicates the center of the highway or that divides wider highways into traffic lanes promotes the safety and efficiency of pavements.

Division VII has been seeking such a device, and other divisions have been experimenting along the same line. Painting of such lines by hand is too slow and expensive. Many difficulties are in the way and where traffic is heavy workers are constantly in danger of injury by passing vehicles. Extensive marking of traffic lines by such methods is impossible.

Public approval of lines already placed in Division VII has prompted further efforts along this line. To meet this demand for an extension of the markings, Foreman Hugh Henry of the Santa Ana district recently developed, at small expense, a mechanical marker that has produced results. Under nearly all conditions it has painted a neat and accurate line at a cost that is quite reasonable.

Marker Described.

Other divisions may be interested in the following description of Mr. Henry's device:

The machine here described was built for a 20-foot width of pavement, but could be made adjustable for use on other widths.

Three 1½" x 10" steel wheels (second-hand wheels from a beet-planting machine, costing $1 each) are attached to a light frame work of structural steel made up largely of ½" x 1½" bars and braced at essential points. To two of the wheels, 13-inch discs (worn-out discs from a disc plow) were bolted to act as a flange or guide along the edge of the pavement. At this end there was also welded a ¾-inch pipe extending upward approximately 27 inches from the axle in the form of an inverted "U." When in operation, one man grasps this pipe handle and holds the flange against the edge of the pavement to secure a uniformly straight line.

The Spray Box.

Ten feet from the inside of the flanges is the four-sided spray box, open top and bottom. It is 5½" wide, inside measurement, by 8" high by 6" long, and made of ⅛" metal. (Photographs show a three-sided box, but it has been decided to enclose the fourth side to protect the spray from the wind.)

Fitting loosely over the bottom of the spray box is the spray box runner made of two steel plates, ⅛" thick, by 15" long, by 3" high, bolted loosely together with two ⅜" by 8" bolts, spaced approximately 6" on centers. This spray box runner slides up and down freely, so that in its vertical position the runner is independent of the spray box, but its horizontal position is fixed. The runners are, therefore, always resting on the pavement exactly below the spray box. This prevents the asphalt from spraying beyond the limits of the runner. By bending in the rear of the two runner plates, any excess of asphalt dropping down from the plates is spread back on the line.

For the preliminary experiments we used a truck on which was mounted a Baker oil heater with a capacity of approximately 15 gallons of asphalt oil. The flexible hose resting

on convenient supports feeds the oil into this center spray box, the four sides of which prevent distortion of the spray by the wind.

Description of Nozzle.

An ordinary oil spray nozzle proved too large and a special nozzle was designed with a 3/32-inch opening. Over this, with openings nearly matching, is placed a ¼-inch cut washer, with a sloping trapezoidal cut, flaring from a width of 1/16 inch at the front to approximately 3/32 inch at the back. On top, acting as a lip or baffle plate, is fastened a ½" x ¾" washer about ⅛" thick. These are assembled with a ¼" cap screw. Installed in the line back of the special nozzle is a ½" pipe cut-off valve.

In order that the machine may be towed behind a truck, a tongue approximately 6 feet long is bolted in two places to the marker frame, and an inch hole in the front end of the tongue permits coupling to ⅝" x 18" rod fastened with ⅝" eye bolts to the right rear end of the truck. Sufficient side play is possible to permit flexibility in operation and overcome irregularities in the pavement or driving of the truck.

One man can lift the marker into a truck for transportation from place to place. *Its cost for material and labor was approximately $35.*

Works Well on Try Out.

The machine was tried out recently on the Jahn and Bressi contract in Orange County. It was successful from the start, painting an unusually stright traffic stripe 5½ inches wide and operating as well on curves as on tangent.

As a guide for the truck driver, a short stick with hanging strip of tin was attached to the running board of the truck so that the tin follows along either center joint or edge of pavement, whichever is most easily visible from the driver's seat. However, as already explained, the accuracy of the guide line is not dependent on the exact position of the truck.

Gilmore 95 per cent asphaltic road oil was used in the marker. This was heated and strained three times before operations began to reduce the danger of clogging the fine nozzle. The hose and nozzle were first heated by feeding the hot oil through the hose into a 5-gallon bucket. This prevented cooling of the oil after work was started.

Sanding not Necessary.

At first the line was sanded, but it soon became apparent that this was unnecessary. Traffic crossing the thin film of oil immediately after its placing did not pick it up or track it over the pavement. However, if it becomes necessary to guard against such a possibility, a light truck can follow approximately 200 feet behind the marker. The line dries rapidly and it will be necessary to keep traffic off but a few minutes.

It was found by actual test that the outfit has a possible speed of two miles per hour. Recharging of the tank and other delays, however, will cut the net progress to about one mile per hour. If a tank with larger oil capacity, say 50 gallons, were used, the mileage painted could be somewhat increased.

If white traffic lines on asphaltic pavements are desired, it is believed a paint-spraying outfit can be substituted for the oil-heating kettle and brushes attached to follow the spray box.

Costs to Operate.

Thirty gallons of road oil were used per mile when marking concrete pavement. On a basis of 8 miles per day and use of one light truck, costs were as follows:

	Total	Per mile
Labor—Foreman and 5 men	$26 27	$3 28
Truck rental and gas and oil	7 50	94
Material—30 gal. 95% asphaltic road oil		2 85
Total		$7 07
If additional light truck is used to protect line and act as supply truck, add		1 81
Total cost		$8 88

Operating force.

Above costs are based on the following force:
Foreman with five men (sixth man needed in case extra truck is used), such force being distributed as follows:
Foreman following marker device, watching line critically and supervising oil feed.
1 laborer guiding flange wheel.
1 truck driver driving truck.
1 laborer at oil pot pumping.
1 laborer ahead with bar opening up and cleaning a shallow groove at edge of pavement.
1 laborer brooming off pavement and groove.

The machine was used recently in Division VIII with generally satisfactory results, according to a report of the division engineer. Costs there were slightly higher than in Division VII. We of the latter division are of one mind on the Henry marker. The machine is not perfect but it is by far the most efficient device for painting traffic lines yet tried by our maintenance crews.

EQUIPMENT DEPARTMENT TO FINANCE EXPERIMENTS

Announcement by R. H. Stalnaker, Equipment Engineer.

THE constant improvement in road building and maintenance equipment has been due in no small part to the inventive genius of the men actually using it. In the past, many highly successful devices have been developed by Commission employees, but there has been no systematic effort to encourage such developments.

With a view to stimulating the improvement of existing equipment and the perfection of new devices to facilitate the economical handling of highway work, the State Highway Engineer has authorized the setting aside from Equipment Department funds of the sum of $10,000 to be expended in experimental work of this nature, in cooperation with the divisions.

While there are some accounting details yet to be worked out, it may be stated that it is the purpose of the Equipment Department to provide the necessary funds for the development, in the several shops, of all ideas for new devices which seem to have sufficient merit to warrant the expenditure, and to make up for use in the divisions where needed duplicates of all successful devices so developed.

RECONSTRUCTION OF HIGHWAY THROUGH CARPINTERIA BEGUN

THE rapid increase in traffic on the state highway south of Santa Barbara, during recent years, has made necessary the early reconstruction of all the highway in the southern part of the county. Most of the existing pavement on this section was built by Santa Barbara County thirteen or more years ago. Within the past year, three reconstruction contracts have been awarded by the commission for work in this vicinity, the latest covering reconstruction of the highway through the town of Carpinteria and for two miles south.

An asphalt concrete pavement thirty feet wide is being placed through the business district; the remainder will be twenty feet in width. A wider roadbed and improved alignment are also a part of the project.

Work has been begun by the Cornwall Construction Company of Santa Barbara, the contractors.

WHAT THE DIVISIONS ARE DOING

DIVISION I.

HEADQUARTERS, WILLITS.
T. A. BEDFORD, DIVISION ENGINEER.
Counties of Del Norte, Humboldt, Mendocino, and Lake.

THE Mercer-Fraser Company of Eureka is making preparations to begin construction of the 4000-foot trestle across Big Lagoon, Humboldt County, the contract for which was recently awarded by the commission. It is hoped this trestle and the necessary approaches may be completed and opened to traffic before another winter. Completion of the project, 1.4 miles in length, will shorten the Redwood highway by two miles and eliminate a bad section as well.

H. W. Rohl, San Francisco contractor, has begun excavation work on his contract for the grading and surfacing of two miles of the Redwood highway at the southern approach to the Klamath River bridge, in Del Norte County. It is expected that this work will be completed in time to open the new road and bridge to traffic during the latter part of the 1926 touring season. Opening of the Klamath River bridge to traffic will eliminate the old free vehicle ferry at Requa, the greatest hindrance to traffic on the entire Redwood route.

The Butterfield-Sears Company has completed the rough grading on its 6.3-mile contract for the widening and straightening of the Leggett Valley section of the Redwood highway in Mendocino County. One shovel is now on the job for the removal of slides. Placing of a crushed rock surfacing will begin in the spring and should be completed by the latter part of the coming summer. The new alignment shortens the old road by .8 of a mile. Many sharp curves have been eliminated.

Slide removal was the most important activity of the division during February. Several serious slides south of Eureka closed the Redwood highway to traffic during the early part of the month.

DIVISION II.

HEADQUARTERS, REDDING.
H. S. COMLY, DIVISION ENGINEER.
Counties of Siskiyou, Modoc, Trinity, Shasta, Lassen, Tehama, and northern Plumas.

MAINTENANCE forces of Division II have begun work on a number of sections of county road taken over for maintenance on January 1st. Within a few months' time the division expects to be making a good showing on these routes.

The Nevada Contracting Company has practically completed its grading and surfacing contract between Halfway Creek and

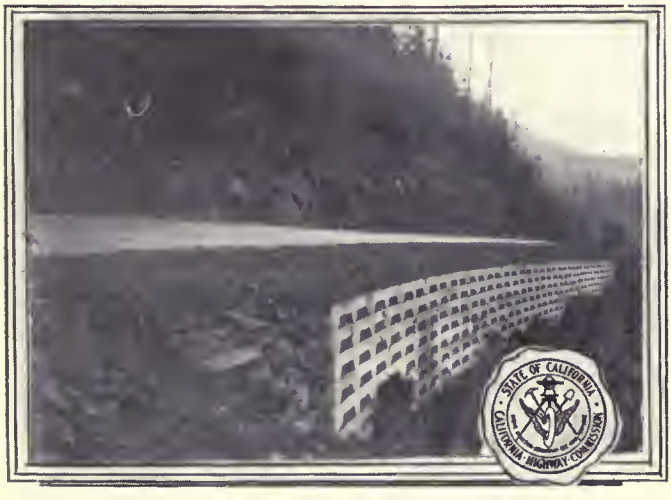
(Continued on page 13.)

DIVISION II FINDS CONCRETE CRIB CHEAPER THAN MASONRY

DIVISION II recently completed a section of retaining wall on the Pacific highway in the vicinity of Weed, Siskiyou County, that has a number of interesting features.

The wall is made in the form of a crib composed of precast reinforced concrete members which interlock one with the other, to form a stable structure. The alternating layers of headers and stretchers are each made up of members 5 inches square and 8 feet long, with necessary lugs for interlock cast at either end.

This particular wall is 165 feet long, varying in height from 4½ to 7 feet. It serves to retain the roadway slopes at a point where the location is on a hillside, immediately above the Southern Pacific Railroad. The crib type was chosen because of the difficulty encountered in securing a safe foundation for the usual type of masonry or concrete wall, and because of the necessity for ample drainage at this point.

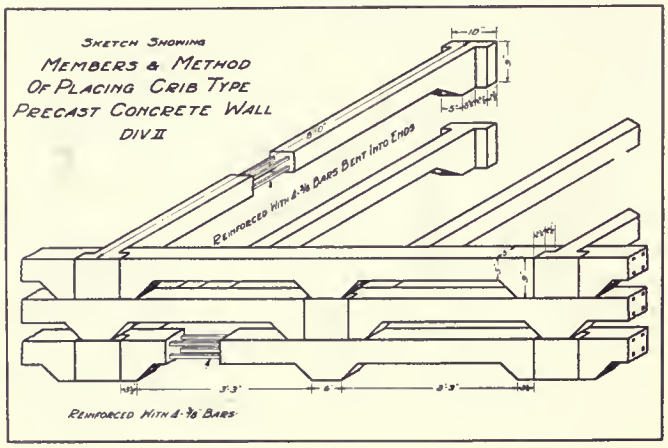


WALL IN DIVISION II—Crib type wall on Pacific Highway built of precast concrete members.

Cheaper Than Masonry.

Due to its lighter weight and flexibility, this type of wall has many advantages and can be placed on foundation material that would not support a gravity wall. Water from behind it drains out freely, eliminating another danger.

Eighteen cubic yards of concrete were used in casting the members of the wall in question. The total cost of the structure, in place, including backfill, was $1,179.45, as compared with an estimated cost of $1,700 for a rubble masonry retaining wall. All of the work can be done by common labor, while walls of other types often require high-priced skilled labor.



DIVISION REPORTS

(Continued from page 12.)

Dog Creek, in the Sacramento canyon. Weather conditions have been slowing up final completion of the work, which should take place not later than March 1st.

It was necessary to detour traffic around the Salt Creek cut for short periods. The five-mile detour was placed under state maintenance and the inconvenience to traffic was not great. This cut, which is a part of the Nevada Company's contract, is now about 100 feet deep from bottom to top of the slope break and is probably one of the deepest highway cuts in the United States. It greatly improves the alignment and considerably shortens the distance at the Salt Creek divide.

BEAUTY PRESERVED—Views on the new section of graded and realigned highway above Placerville on the route to Tahoe. Removal of dangerous curves has not destroyed the beauty of this historic state road. (Photo by Division III.)

DIVISION III.

HEADQUARTERS, SACRAMENTO.

F. W. HASELWOOD, ACTING DIVISION ENGINEER.

Counties of Butte, Colusa, El Dorado, Glenn, Nevada, Placer, southern Plumas, Sierra, Sutter, Yuba, and northern Sacramento and Yolo.

DESPITE adverse weather conditions, the Nevada Contracting Company is ahead of schedule on the grading of the six-mile section between Floriston and the Nevada line in the Truckee River canyon. Three miles of rough grading has been completed. A force of eighty men and four power shovels are at work at the present time.

The Irey and Holden contract for grading work between Boca and Floriston, 5.3 miles, has been completed and work is now progressing on the extension of the contract for the building of the approaches to the Hinton bridge.

El Dorado Project Completed.

The contract of Irey and Holden for the grading and surfacing of 5.8 miles of the state highway above Placerville, from Camino to two miles east of Sportsmen's Hall, was completed on January 4th, the exact date scheduled under the contract. This is the first major reconstruction project on the old state road east of the asphalt macadam pavement in the vicinity of Camino. The sharpest curve on the new road has a radius of 550 feet and there are no grades in excess of 6.3 per cent. It is on new right of way most of the distance east of Sportsmen's Hall. A total of 37,900 cubic yards of material was moved. Motorized equipment was used throughout. H. R. Church was resident engineer for the commission.

Removal of the wooden trestle at North Sacramento has been begun. The macadam surfacing is being used as rip rap to protect the slight fill on which the new ground level pavement was placed. Except for minor finishing, the project was completed several weeks ago.

Bridges Opened.

Timber trestle bridges across Walker Creek on the Willows lateral in Glenn County and across sloughs west of Chico on the Chico-Orland road have been completed, except for the asphalt surfacing, which will not be placed until spring.

An informal contract has been awarded to Joseph Birkett of Grass Valley for the placing of 610 feet of cement concrete pavement eight feet wide and six inches thick on the state highway at the approach to Grass Valley. The new section will complete a full width street where a car track was removed.

Maintenance Begun.

Division III has started improvement of several sections of county road taken over for maintenance on January 1st. Superintendent Dan Breuning is working on route 15, west of Grass Valley, Nevada County; Foreman C. G. Sackett on route 65, south of El Dorado, El Dorado County; Foreman J. E. Stevens on route 15, east of Long Bridge, Sutter County; and P. Forrest has charge on the same route west of Williams, Colusa County.

Superintendent H. L. Montfort is placing disinegrated granite surfacing on sections of the highway east of Placerville.

DIVISION IV.

HEADQUARTERS, SAN FRANCISCO.

JOHN H. SKEGGS, DIVISION ENGINEER.

Counties of San Francisco, Marin, Sonoma, Napa, Contra Costa, Alameda Santa Clara, Santa Cruz, and San Mateo.

COMPLETION and acceptance of the first contract for grading on the Bay Shore highway in San Mateo County shows

DIVISION REPORTS

that the quantity estimates of Division IV came within three per cent of the actual yardage moved.

The estimate for the construction of the 5.2 miles of embankment, 60 feet wide and approximately 5 feet in height, was 702,000 cubic yards, 162,000 cubic yards to be obtained by canal excavation and 540,000 to be secured from a borrow pit and hauled to the fill. Final quantities show 159,000 cubic yards of excavation and 520,000 cubic yards of borrow, or 22,900 yards less than the estimate.

Much study and thought was given this project by the Division. Valuable data were obtained from the Southern Pacific Railroad, which maintains fills across adjacent marsh lands where conditions are similar. Borings also were made along the line of the highway in connection with the studies of probable shrinkage and settlement. Fifty per cent was added to the preliminary estimate based on the survey of cross section quantities.

The fill can not be opened to traffic until it has thoroughly dried out and a surfacing of rock has been placed. This unusual project was completed by D. A. Foley & Company of Los Angeles prior to the recent storms.

Slides on Skyline.

Heavy rains of recent weeks have resulted in numerous slides on the recently completed section of the Skyline boulevard which was closed to traffic during the early part of the month. Maintenance crews have much work to do between Bear Gulch and La Honda road.

Stormy weather has delayed final completion of the widening work on the Peninsula highway between Cypress Lawn Cemetery and San Bruno. This section, however, is now open to traffic for its entire length.

DIVISION VII.

HEADQUARTERS, LOS ANGELES.

S. V. CORTELYOU, DIVISION ENGINEER.

Counties of Los Angeles, Ventura, Orange, San Diego, and eastern Kern, south of Mojave.

PLACING of cement concrete pavement on Whittier boulevard in Los Angeles County is complete from Montebello to Philadelphia street, Whittier, and good progress is being made on the pavement east to Michigan avenue. This is a major reconstruction project.

Nearly six miles of "second story" concrete pavement have been completed on the reconstruction of the highway in San Diego County between Oceanside and San Onofre. On the important line change between San Onofre and San Mateo Creek, the concrete pavement has been completed and the construction of shoulders is now in progress.

Good progress is being made on the contract for improving the alignment on the Mountain Springs grade in San Diego and Imperial counties. Two shovels and two rock drilling outfits are in operation.

Work on Coast Route Progressing.

Progress is reported on the grading of the Coast highway between Laguna and Serra, in Orange County. This seven and four-tenths-mile section of highway, when graded, will be surfaced with crushed gravel.

Grading operations are well under way on the reconstruction of the highway in Ventura County between Camarillo and Ventura. Double-decking of the old fifteen-foot pavement with cement concrete has been started.

A day labor camp has been established on the Coast highway near Point Mugu, in Ventura County, for the purpose of quarrying and placing heavy riprap rock along embankment slopes where the ocean waves are causing damage to fills. Considerable work of this nature must be done as a result of recent storms.

DIVISION IX.

HEADQUARTERS, BISHOP.

F G. SOMNER, DIVISION ENGINEER.

Counties of Inyo, Mono, and eastern Kern County, north of Mojave.

HARRY Wilson is making rapid progress on his grading contract for work on Route 23 in Kern and Inyo counties, distance 36.7 miles. That portion lying between Ricardo and Indian Wells, 22 miles, has been opened to travel.

The forty-foot roadway now being graded on the state survey between Mojave and Kramer by Supervisor J. I. Wagy of Kern County is nearing completion. It will be taken over by state maintenance forces as soon as the grading is completed.

Division IX was visited recently by J. K. Kinsman and W. E. Peck of the Equipment Department, who are in charge of plans for the new shop building to be constructed at the Bishop maintenance yard.

M. E. Mihills, transferred from Division III last month, is now in charge of equipment at the Bishop shop.

Research engineers from Headquarters, W. J. Stonebreaker in charge, recently inspected metal culverts in this division in connection with the state-wide study.

The division headquarters was visited recently by C. E. Malm and Carl Smith of the accounting department.

The Little Tourist.

Betty was taking her first ocean voyage, and for the first three days the sea was smooth as glass. On the fourth day out, a squall came up and the good ship bounced around like a broncho.

"Mother," finally said Betty, "What's the matter? Are we on a detour?"

Solomon's 777th Wife: "Sol, are you really and truly in love with me?"

Solomon: "My dear, you are one in a thousand."

And she snuggled closer.

PROBLEMS ON THE MALIBU—*Above*, grading along the Los Angeles County coast made difficult by alternating layers of sand and clay in the material to be excavated. *Center*, a beach to be made accessible. *Below*, crossing a ravine by means of a deep fill. (Photos by Div. VII.)

BRIDGE DEPARTMENT NEWS

HARLAN D. MILLER, Bridge Engineer.

ACCORDING to reports from engineers on the ground, completed sections of the Ventura seawall were undamaged by the terrific tides and high seas which pounded the coast line of the southern counties during recent storms. The concave surface of the wall threw back the waves and proved the effectiveness of the design. The storm, the worst in years, is considered a severe test of the new wall.

The new 432-foot reinforced concrete bridge over San Gabriel River, between Los Angeles and Whittier, and the subway under the tracks of the Union Pacific Railroad on the same route are about completed. They represent important projects authorized during 1925. The San Gabriel bridge is forty feet wide, with sidewalks in addition, the widest bridge on the state highway system to date.

C. M. Butts has been named resident engineer for the Big Lagoon project on the Redwood highway, in Humboldt County. The long pile trestle will consist of 209 spans each 19 feet long. Cedar piling will be used while the remainder of the structure will be of redwood. Work has been begun by the Mercer Fraser Company, contractors.

The San Juan Creek and San Onofre Creek bridges on the Coast highway in Orange and San Diego counties have been completed and accepted. The latter is a part of an important realignment project.

QUICK ACTION COMMENDED

DIVISION III was informed recently by the Sutter County Chamber of Commerce that the flash signal at the Lomo crossing at the Southern Pacific was not working properly. The light was immediately adjusted and as a safety measure a reflector was placed in front of each signal. A culvert at this point also was improved.

The president of the Sutter body made the following comment upon these improvements:

SUTTER COUNTY
CHAMBER OF COMMERCE

Yuba City, California,
January 22, 1926.

Mr. F. W. Haselwood.
Acting Division Engineer,
California Highway Commission,
Sacramento, California.

Dear Sir:

Your letter of January 21 in regard to the flash lights and culvert ending at Lomo has just come.

The improvement that you mention—placing Redflex Reflectors in front of each flash signal, and extending the present pipe will, I am sure, eliminate the hazards that I reported to you.

I am very glad that you have taken up these matters so decisively and consider your doing so another illustration of the efficient handling of your State Highway affairs.

Very truly yours,

(Signed) P. T. Hincks,
President.

CALIFORNIAN HONORED

Thomas E. Stanton, Jr., assistant state highway engineer, has been elected a member of the executive committee for 1926 of the highway division of the American Society of Civil Engineers. Mr. Stanton is the only member of the committee to be chosen from the western section of the country.

"Boy, Ah comes fum a tough family. My ole man done cut his nails wif an axe, and brush his teef wif a file."

"Huh, that ain't so tough. My ole man am a plumah and he done shave hisself wif a blowto'ch."

HIGHWAY NEWS NOTES

WHILE on an inspection trip over highways in Division I, State Highway Engineer R. M. Morton was tendered a dinner by the board of supervisors of Humboldt County and citizens of Eureka, following which he delivered an illustrated talk on the highway system. Mr. Morton was accompanied by Maintenance Engineer G. R. Winslow.

Charles Talsma and Stanley Dunsmire, clerks in the division office at Willits, recently took unto themselves brides in the persons of two Willits school teachers.

Division II Changes.

T. A. Roseberry and W. I. Templeton, assistant resident engineers, have been transferred from Division II to Division VII. R. E. Halter, instrument man, has been transferred to Division VIII and A. W. Williams, J. A. Williams, and H. S. Marshall are doing survey work for Division I in Lake County.

H. S. Comly, division engineer at Redding, has been acting as a member of a civil service examining board in several of the divisions.

R. E. Ward, resident engineer, has been transferred to Red Bluff as maintenance superintendent succeeding E. L. Stump, resigned.

Transferred to Division VIII.

F. R. Baker, for many years resident engineer in Division III, has been transferred to Division VIII.

W. H. Miller, maintenance foreman Division III, is now with the equipment department in charge of Shop III, succeeding M. E. Mihills who has been transferred to the shop at Bishop, Inyo County.

The Style in Division V.

Girls seem to be all the rage in Division V. Recent fathers of daughters are E. B. Brown, resident engineer, Summerland; C. P. Sweet, assistant resident engineer, Pismo; and W. P. Inman, draftsman, San Luis Obispo.

Headquarters Given Surprise.

Miss Margaret Stewart, stenographer, formerly with the equipment department, gave headquarters a thrill recently when she announced that for some time she had been in reality Mrs. Edward Phipps. The wedding took place in Carson City, Nevada.

Engineers Have Misfortunes.

Misfortune befell two well known engineers of Division VIII recently. H. O. Ragan, resident engineer on the Riverside-Ontario paving project, was painfully injured in an automobile collision near Riverside and was removed to a hospital in that city and later to his home.

The home of Resident Engineer T. R. Goodwin, at Winterhaven, Imperial County, was destroyed by fire. It was reported Mrs. Goodwin narrowly escaped death, leaving her bedroom just in time to escape the falling ceiling. All property in the home was lost including memoirs which Mr. Goodwin gathered when he piloted a 28-foot yacht from New York to Italy. These included papers signed by the King of Italy, letters from Caruso, and other valuables which can not be replaced.

CALIFORNIA HAS 5.68 PER CENT OF WORLD'S MOTOR VEHICLES.

CALIFORNIA, on January 1st, had 5.68 per cent of all the motor vehicles of the world. The total world registration on that date was 25,973,928, according to a report of the Department of Commerce. The registration for the United States was 19,999,436, or 77 per cent of the world's total. The California registration was 1,475,913.

Californians own more than a twentieth of the world's cars and 7.38 per cent of the number registered in the United States. Only New York exceeded the golden state among the states of the union.

The value of all motor vehicles registered in the United States, the Commerce Department estimated at $11,000,000,000. At this rate, the value of California-owned cars would be $811,800,000.

STATE HIGHWAY FUND CONTRACTS (Bond Funds, Including Federal Aid)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE JAN. 18, 1926.						
466	VII	San Diego	2	D	Across San Onofre Creek		Reinforced Concrete Bridge	Fluor Construction Co.	$62,118 28	May 4, 1925	
					AWARDED SINCE JAN. 18, 1926.						
493	X	Yolo	6	C	Fifth St. in Washington to the M St. Bridge	0.25	Grading	H. V. Tucker Co.	$17,640 00	Feb. 8, 1926	90
					Sub-total	0.25			$17,640 00		
					PENDING AWARD—None.						
					Total State Highway Fund Contracts Awarded and Pending Award	0.25			$17,640 00		

NOTE—Primary construction covered by the above contracts does not include funds obligated on cooperative forest highway projects, prison camp road activities, or day labor jobs not being done under contract.

STATE HIGHWAY MAINTENANCE FUND CONTRACTS (Including Gasoline Tax Fund)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE JAN. 18, 1926.						
M-68	III	Sacramento	3	B	Western Pacific R.R. Crossing		Underpass	Lord and Bishop	$44,881 88	April 15, 1925	
M-70	VII	Orange	2	A	Across San Juan Creek		Bridge	Stevens Bros. and Haas	28,773 68	April 15, 1925	
M-94	VI	Fresno			City of Fresno		Maintenance Shop Building	J. P. Williams	32,953 50	July 29, 1925	
M-112	VI	Kern	4	F	One mile south of Delano to 1.8 miles south of Delano	0.75	Asphalt Concrete Pavement	Warren Construction Co.	16,635 38	Dec. 14, 1925	
					AWARDED SINCE JAN. 18, 1926—None.						
					PENDING AWARD—None.						

NOTE.—The above obligations charged against the State Highway Maintenance Funds do not include funds from these sources obligated for general maintenance and for specific betterments being done under day labor authorization.

Seattle Public Library

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CALIFORNIA HIGHWAYS

A BULLETIN ISSUED BY THE CALIFORNIA HIGHWAY COMMISSION FOR THE INFORMATION OF ITS EMPLOYEES AND THE PUBLIC

Vol. 3 MARCH, 1926 No. 3

OLD AND NEW AT SAN GABRIEL RIVER—New state bridge on the highway between Los Angeles and Whittier is now open to the public. It has a clear roadway width of forty feet and, in addition, a five-foot sidewalk on either side. The new bridge, the widest on the state system, takes the place of the congested wooden structure built by the county and shown in the inset. The gasoline tax provided funds for this project. (Photos by Bridge Department.) (See description on page five.)

In this issue: REVIEW OF STRENGTH RECORD FOR 1925 PAVEMENTS.

MAY 7 1926

CALIFORNIA HIGHWAYS

HARVEY M. TOY, Chairman;
N. T. EDWARDS and LOUIS EVERDING, Commissioners.

ROBERT M. MORTON, State Highway Engineer.

W. F. MIXON, Secretary.

We are pleased to permit publication of any of the matter contained herein or to loan cuts, and this privilege is extended newspapers and periodicals without restrictions.

FRANK B. DURKEE - - - Editor
P. O. Box 1103, Sacramento, California.

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CALIFORNIA HIGHWAY DEPARTMENT

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FEDERAL AID FOR ROADS NOT CHARITY

(From the San Bernardino *Sun.*)

CALIFORNIA has been apportioned $2,484,706 in federal aid money for highways and perhaps there will be a new outcry from the eastern states that such a large sum of money is to be expended by the government in the far west.

This money is not charity from the government, as the situation is viewed through California eyes, for the United States government owns a vast domain of not less than 20,000,000 acres of land, exclusive of worthless desert, in California. On this vast holding of property there can be no tax levy by the state or any county, school district, or road district. The other property of the state must pay the taxes for the upkeep of this federal land.

In San Bernardino County there is mile after mile of open government land on each side of the transcontinental highways. There is no way to raise adequate funds for highway work in these sections of San Bernardino County, and to relieve the situation California has taken over the building and maintenance of all the transcontinental highways in San Bernardino County, but the only way that the state can properly, or rather even meagerly finance operations on these roads, is from the federal aid funds.

The manner in which the California Highway Commission protested the original suggestion that federal aid be abandoned is known to have aided in the change of sentiment in Washington.

Three Billions For Fun.

Begin now to save money for next summer's vacation. A line-up of government figures leads to a reasonable conclusion that the American people spend about $3,000,000,000 a year for vacations. That's perhaps five per cent of our national income—a nickel wind-up for a 95-cent run.

The country has liberated itself from the conviction that the secret of success is ten hours a day, six days a week, fifty-two weeks a year. The nation was chopped out of the woods and shoved over the mountains under that formula, but that was another day and another way.

The average vacation is two weeks, time enough to find out how a man three states away plants his corn, regulates motor traffic and catches fish; time enough to find out that there's a national mind, a national ambition and a national struggle. It is the best safeguard the country has against sectionalism and provincial content. It's cheap at $3,000,000,000.—*Collier's Weekly.*

MARCH 1926

California Highways

VOL. 3 No. 3

RECORD FOR 1925 SHOWS REMARKABLE INCREASE IN STRENGTH OF CALIFORNIA PAVEMENTS

By Earl Withycombe, Assistant Engineer, Construction Department.

CONSTRUCTION Department records conclusively show that the strength of Portland cement concrete pavements laid by the California Highway Commission has been constantly improving, and, furthermore, that all types are becoming smoother and easier riding.

The average strength of the Portland cement concrete pavements has in 1925 increased 40 per cent over that obtained in 1924, and as much as 55 per cent over the average of former years. Expressing it in another way and considering the value of the pavement on a compressive strength basis, the six-inch slab cast during 1925 is the equivalent of eight and one-half inches of the 1924 concrete. The result is all the more remarkable when we consider that it was obtained without any increased cost to the state.

More attention than ever before is being paid to the scientific proportioning of mixtures going into all types of pavements, and this feature, combined with painstaking attention to details of mixing and placing, is reflected in a better quality product and a smoother riding surface.

Portland Cement Concrete.

The earnest and conscientious efforts of the field men are largely responsible for the splendid record of the past year. They have industriously adhere to the methods of design, control, and manipulation of mixtures to give a maximum strength concrete with reasonable workability, as worked out by C. S. Pope, construction engineer, and C. L. McKesson, materials and research engineer. To the field men, primarily, and to cooperating contractors, credit is given for the results obtained. The efforts of the department are now being directed to securing better uniformity and more careful workmanship as regards finish of surface, placing of joints and other details.

How Strength is Determined.

Strength of concrete is determined by crushing specimens 6 inches in diameter by 12 inches in height, cast in the field from the mix as it is deposited upon the subgrade. These casts are cured on the job and shipped to the laboratory in time to be broken in the testing machine at the proper interval. Casts for both ten- and twenty-eight-day breaks are taken during the early part of the job. The former are discontinued after ten specimens have been submitted and the twenty-eight-day specimens are regularly cast until the job is finished. Each specimen as a rule represents approximately 250 cubic yards of concrete on a twenty-foot width paving job but smaller yardages are represented on narrower pavements and shoulder work.

The ten-day breaks are an early indicator of the strengths to be expected and the twenty-eight-day breaks are accepted as the true indicator of the ultimate strength.

In addition to the specimens submitted during construction, test cores about 4½ inches in diameter are drilled from the completed pavement as the department may direct.

Strength of Portland Cement Concrete.

Compressive strength of Portland cement concrete is recorded as the load required in pounds per square inch to rupture the test cylinders or cores.

The average strength of the individual cement concrete pavements constructed in 1925 ranged from 3427 to 5109 pounds per square inch. The general average for the year was 4311 pounds. The average for the year 1924 was 3151 pounds. Individual jobs varied from 2662 to 3950 pounds per square inch. Portland cement concrete shoulder widening ranged from 3370 to 4220 pounds per square inch during 1925, and from 3310 to 4220 pounds in 1924.

The difference in strength between full width pavement and shoulder concrete is due largely to the fact that in the latter a more plastic mix is required because the narrow width necessitates hand tamping and, furthermore, on shoulder work central mixing plants are generally used.

Daily Reports Required.

Daily reports of the mixtures used, grading of the aggregate, proportion of water and yield of concrete in place are submitted by the resident engineers. The department in this way is kept in close touch with the work during construction.

(Continued on next page.)

CALIFORNIA'S STRONG PAVEMENT—*Left* and *right*, sections of new pavement on the Redwood highway near Healdsburg, Sonoma County, Division IV, the compressive strength of which averaged 5109 lbs. per square inch at twenty-eight days. *Center*, typical section of the old fifteen-foot pavement widened and thickened by the new slab which has a width of twenty feet. (See table on page five.)

STRENGTH OF CALIFORNIA PAVEMENTS SHOWS INCREASE

(Continued from page 3.)

Field inspections are made at frequent intervals during construction by representatives of the Construction Department, who make personal checks of the gradings and proportioning of aggregates. Subsequent inspections are made of the project at yearly intervals to better judge the suitability of the type and design of the individual pavement under known traffic conditions. These inspections consist of a vialog record of the project, a crack survey and the noting of individual items of interest. Rate of smoothness from the vialog record indicates the resistance of the pavement and its foundation to displacement. The crack survey establishes the normal interval between cracks and indicates the value of designed joints in preventing injury to the pavement from expansion or contraction.

Asphaltic Pavements.

As yet no satisfactory test has been applied to asphaltic mixtures to show their comparative ability to resist displacement. In warm weather pavements of this type tend to fail under traffic by pushing or rolling, and, when the temperature is low, by cracking or disintegrating. During the past several years, the department has, by careful study and observation of its own work, come to several definite conclusions regarding the satisfactory performance of asphaltic mixture, which, in full or in part, check the claims of individual investigators.

The most important points are the proper proportions of asphaltic cement, amount and character of very fine material, and the proper grading of the aggregate to produce a mixture of maximum density.

Testing of Asphaltic Pavements.

A sample of the uncompressed mixture as it leaves the plant, two sample tins of the asphaltic cement used, and a sample of the rolled and completed pavement are secured daily, and submitted to the laboratory. The uncompressed sample is used to determine the amount of asphaltic cement present and the grading of the aggregate. The daily samples of the asphaltic cement are used as a check on the quality of cement previously sampled in bulk. The compressed sample is used to determine the specific gravity of the finished pavement and when compared with the relative gravity of the individual aggregates denotes the density of the finished product. These laboratory results are reported back as quickly as possible to the resident engineers for their guidance.

Reports of the mixtures used and grading of the individual aggregates are submitted on a daily report to the department by the resident engineer.

Field inspections are made by representatives of the Construction Department at regular intervals and a personal check made of the materials, proportioning and handling of the mixtures.

Vialog Records.

As a method of comparing the riding qualities of pavements, the vialog has proven an invaluable aid to the department. It is stimulating interest among contractors as well as engineers in the effort to secure smooth pavements. Smoothness is not only a welcome convenience to the traveling public, but is also of vital importance to the life of a pavement. *Smoothness eliminates impact, which is the greatest enemy of any type of pavement.*

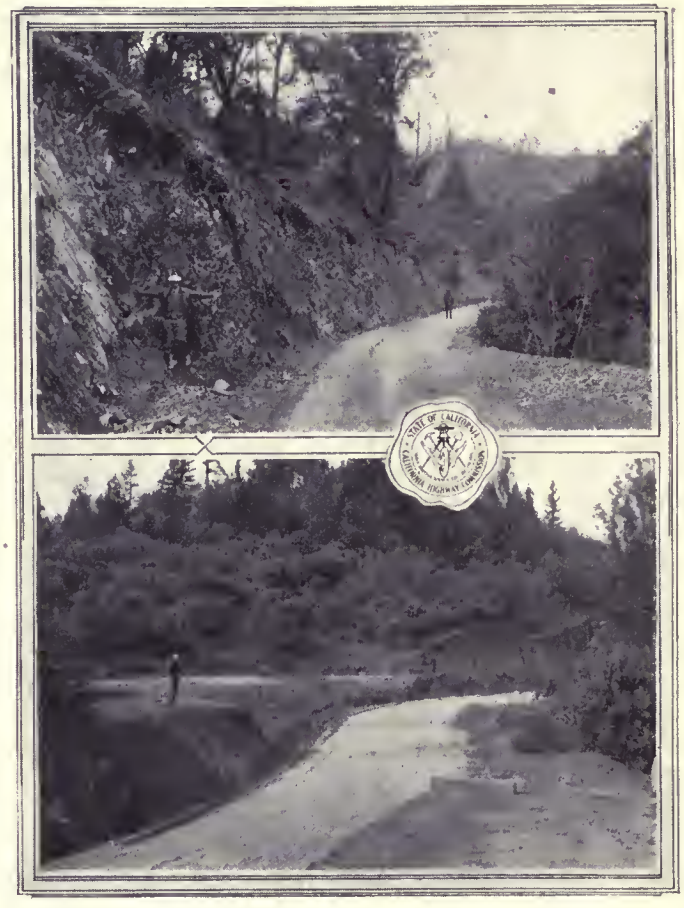
Portland cement concrete pavements constructed in 1925 ranged from 6.4 to 43.0 inches of roughness per mile. The general average was 14.3 inches.

Asphaltic concrete pavements constructed in 1925 ranged from 18.9 to 90.6 inches of roughness per mile with a general average of 33.2 inches.

The general average of all pavements constructed in 1925 was 18.8 inches as compared with a record of 22.2 inches per mile for 1924.

Where constructed shoulders were of sufficient width to carry a vehicle a vialog record was taken and included in the general average.

(See table on page five.)



STRAIGHTENING THE PACIFIC HIGHWAY.—Graphic views of reconstruction work recently completed in the Sacramento canyon, north of Redding. *Above*, position of the engineer indicates width of cut back into the bank. This material is used to widen the outer shoulder. *Below*, a line and grade change, old road at the left.

AN ENGINEER'S JOB

HIGHWAY location is not a function of the state legislature in the opinion of Governor Smith of New York state. In giving his approval to a legislative bill increasing the state road system by some 2400 miles he stated that the system was apparently as perfect as could be secured by the existing method. He added: "Laying out highway routes I do not believe to be a legislative function. It is an engineering problem and while it remains a legislative one we will never be able to resist the tendency to lay out new routes as a result of log-rolling projects in the legislature not strictly destined to improve the state highway system but rather to promote the interest of some localities."

The road is the physical sign or symbol by which you will best understand any age or people. If they have no roads, they are savages; for the road is a creation of man and type of civilized society. If you wish to know whether society is stagnant, learning scholastic, religion a dead formality, you may learn something by going into universities and libraries, something also that is being done on cathedrals or churches or in them, but quite as much by looking at the roads, for if there is any motion in society, the road, which is the symbol of motion, will indicate the fact.—Bushnell.

New Bridge Completed on Historic Whittier Boulevard

ON THE road that has continued through the years, from the period of Spanish exploration to the days of state highways, the great traveled route from Los Angeles southward, the California Highway Commission has completed one of the most magnificent structures on the state highway system—the new reinforced concrete bridge across San Gabriel River on the Whittier Boulevard, Los Angeles County. Views of the bridge are shown on the front cover.

Average traffic on this route at the Los Angeles city limits, not far away, often is in excess of 20,000 vehicles per day, making it one of the heaviest traveled of all state highway routes. It seems incredible that this great volume of traffic was able to squeeze through the narrow county-built bridge erected several decades ago. It was not possible without aggravating delays and serious accidents, as great volumes of food stuffs are trucked into Los Angeles over this route.

Part of Widening Project.

Widening of the pavement on the Whittier road to fifty-six feet, a program inaugurated by the Commission in 1924, made construction of a new bridge imperative. The new structure, which was built alongside of the existing bridge so as to interfere as little as possible with traffic, is now completed and open to travel.

In many respects its standards are the highest of any bridge on the state highway system. Its clear roadway of forty feet is in excess of the width of any existing bridge on the state highway. In addition, it has two six-foot sidewalks for pedestrians. The bridge consists of eight fifty-four-foot spans, making its total length 432 feet. Three thousand cubic yards of concrete went into its building together with 400,000 pounds of reinforcing steel.

Charles and F. W. Steffgen of San Diego were the contractors and the cost was approximately $95,000, a charge against the gasoline tax reconstruction fund. C. W. Jones and A. S. Kennedy were resident engineers for the bridge department, which had charge of the project.

The bridge was formally dedicated and opened to traffic by co-eds from Whittier College before a large gathering of officials and citizens of the East Side district together with representatives of the Highway Commission.

Good Roads Versus Sin.

The author of a recent treatise on the economic cost of sin to the United States estimates it at $13,000,000,000 a year, certainly a startling sum.

The Bureau of Public Roads at Washington says that the current year will witness the construction of 24,000 miles of improved highways in the United States at a cost of more than a billion dollars. A billion dollars for roads, large as it is, is small compared with the annual waste of $13,000,000,000 for forms of self-gratification, described as sin.

"The wages of sin is death," according to high authority, but good roads lead to economic efficiency and joy and prosperity that will endure. How would it do to cut a billion dollars off the sin appropriation during the new year and build 48,000 miles of improved highways in 1926?—*The Earth Mover.*

California Highway Commission—1925 Paving Projects

Division	County	Route	Section	Contract No.	Contractor	Resident Engineer	Ave. strength of concrete at 28 days, lbs. per sq. in.	Vialog index of roughness, inches per mile	Ave. interval of designed joints, feet	Ave. interval of joints and cracks, feet	Ave. variation in cement used per day, per cent	Ave. yardage or tonnage laid per day
PORTLAND CEMENT CONCRETE PAVEMENTS.												
I	Humboldt	1	H	444	J. F. Knapp	H. C. Ingle	4,980	11.7	33.3	31.3	2.2	183
II	Tehama	7	A	472	E. A. Burns	R. A. Tremper	4,053	29.7	47.4	45.6	2.1	48
III	Sacramento	3	B	M-98	Kaiser Paving Co.	F. R. Baker	3,427	43.0	88.0	70.5	2.4	80
IV	Sonoma	1	B	M-90	J. V. Galbraith	G. Wade-M. C. Fosgate	5,109	29.5	87.0	55.0	2.1	201
VI	Merced	4	C-D	M-64	H. H. Peterson	P. L. Wilcox	4,070	11.7	91.5	40.0	1.5	171
VII	Orange	2	A	M-74	Jahn and Bressi	C. N. Ainley	3,710	12.0	87.6	69.2	1.9	224
VII	San Diego	2	D	M-83	R. A. Wattson	W. D. Eaton	3,653	6.4	92.6	82.2	2.4	167
VIII	San Bernardino-Riverside	26	B-A	458	Basich Bros.	R. L. Young	4,200	10.0	100.0	40.8	0.6	250
VIII	San Bernardino	26	A	M-84	Basich Bros.	R. L. Young	3,614	9.9	97.3	63.5	1.3	239
X	San Joaquin	4	A-B	M-65	J. F. Knapp	C. M. Butts-C. W. Springer	4,490	10.5	80.6	61.2	1.1	224
PORTLAND CEMENT CONCRETE SHOULDERS.												
*IV	San Mateo	2	A	M-78	Federal Paving Co.	R. E. Messner	4,220	27.9			1.5	187
V	Santa Barbara	2	J	M-72	Cornwall Construction Co.	E. B. Brown	3,580	17.9			1.7	105
*VI	Fresno	4	C	M-69	Stewart and Blaod	W. K. Reed-H. O. Ragan	3,370				1.5	76
*X	Yolo	6-7	A	M-62	Kaiser Paving Co.	F. C. Hewitt	3,550	33.9			1.9	105
ASPHALTIC CONCRETE PAVEMENTS.												
III	Butte	47	A	451	Chico Contracting Co.	F. R. Baker		90.6				129
IV	San Mateo	2	A	M-78	Federal Paving Co.	R. E. Messner		24.7				196
V	Santa Barbara	2	J	M-72	Cornwall Construction Co.	E. B. Brown		27.2				173
VI	Kern	4	D	M-82	Federal Paving Co.	H. O. Ragan		18.9				319
X	Sacramento	4	B	M-100	A. Teichert and Son	A. Wallace		24.4				286
X	Yolo	7	A	DM-50	Force and Currigan	C. M. Butts		56.7				220
X	Sacramento	53	A	DM-61	Valley Paving Co.	C. M. Butts		56.3				178

*Central Mix.

Chart Presentation of Elements Affecting Concrete Construction

By C. S. Pope, Construction Engineer.

THE following charts have been prepared for use of resident engineers and others with a view to predicting results which may be expected on different phases of concrete construction.

The data have been assembled from various sources which seem dependable but principal reliance has been placed on material available at this time from our own laboratory.

In common with all such generalizations, individual cases, due to the very numerous causes which may affect the results of tests of concrete materials may be expected from time to time to show results at considerable variance with the findings of these charts.

Application of common sense and discrimination in their interpretation, however, will enable engineers to recognize the influence of these various factors and will make the charts of great value to those who have occasion to use them, and who properly interpret the data furnished by them.

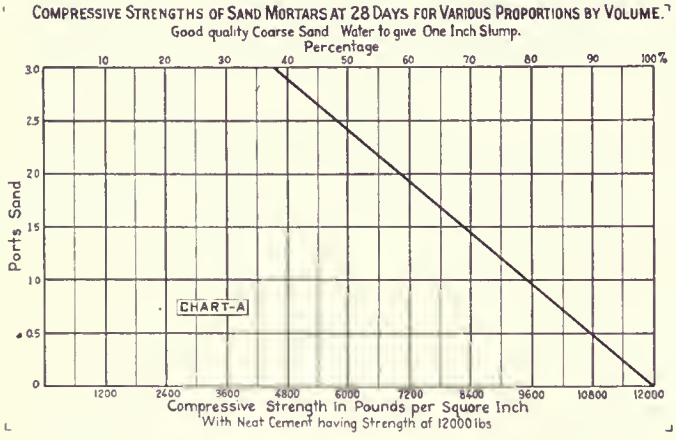
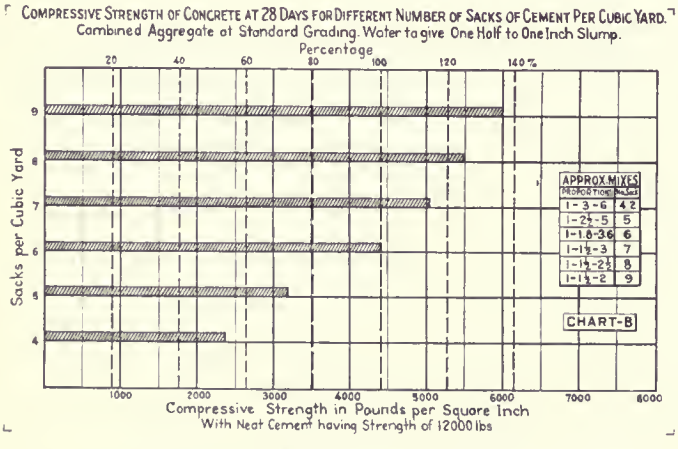

COMPRESSIVE STRENGTHS OF SAND MORTARS AT 28 DAYS FOR VARIOUS PROPORTIONS BY VOLUME.
Good quality Coarse Sand Water to give One Inch Slump.
Percentage
10 20 30 40 50 60 70 80 90 100%
3.0 2.5 2.0 1.5 1.0 .5 0
Parts Sand
CHART-A
1200 2400 3600 4800 6000 7200 8400 9600 10800 12000
Compressive Strength in Pounds per Square Inch
With Neat Cement having Strength of 12000 lbs

CHART A. This chart gives compressive strengths of sand mortars of various proportions. The strengths are given in percentages of compressive strength of neat cement. A cement having a compressive strength, neat, of 12,000 lbs. per square inch at 28 days is assumed as 100% and all values given are prorated on the basis of the use of this cement in the varying proportions required.

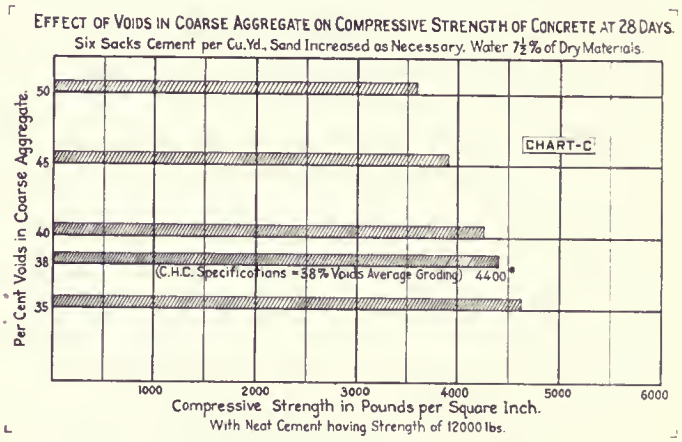

COMPRESSIVE STRENGTH OF CONCRETE AT 28 DAYS FOR DIFFERENT NUMBER OF SACKS OF CEMENT PER CUBIC YARD.
Combined Aggregate at Standard Grading. Water to give One Half to One Inch Slump.
Percentage
20 40 60 80 100 120 140%
9 8 7 6 5 4
Sacks per Cubic Yard
APPROX MIXES
1-3-6 4 2
1-2½-5 5
1-1 8-3 6
1-1½-3 7
1-1¼-2½ 8
1-1¼-2 9
CHART-B
1000 2000 3000 4000 5000 6000 7000 8000
Compressive Strength in Pounds per Square Inch
With Neat Cement having Strength of 12000 lbs

Sand Assumed Structurally Sound.

The strength ratio shown assumes a sand which is structurally sound. A sand which is structurally weak will show higher strength ratios with a cement having a low neat strength than with a cement having a high neat strength. The stronger cement brings out the weakness of the sand and the strength ratio for such a material would not be a straight line in the graph shown.

Sixty per cent is probably a conservative figure to use in estimating the probable strength of field concrete based on mortar strengths, the ratio of sand to cement in both concrete and mortar being the same.

CHART B. This chart shows compressive strength of concrete with varying cement content. The compressive strength is shown in pounds per square inch based on first-class aggregate,


EFFECT OF VOIDS IN COARSE AGGREGATE ON COMPRESSIVE STRENGTH OF CONCRETE AT 28 DAYS.
Six Sacks Cement per Cu.Yd., Sand Increased as Necessary. Water 7½% of Dry Materials.
Per Cent Voids in Coarse Aggregate.
50 45 40 38 35
CHART-C
(C.H.C. Specifications = 38% Voids Average Grading) 4400
1000 2000 3000 4000 5000 6000
Compressive Strength in Pounds per Square Inch.
With Neat Cement having Strength of 12000 lbs.

and cement testing neat at 12,000 pounds per square inch at 28 days. The concrete is assumed to have a ½- to 1-inch slump, the water varying slightly as required by its aggregate.

CHART C. This chart shows the effect of voids in coarse aggregate on compressive strength. The graph is particularly valuable and is shown both in percentages and in pounds per square inch. The effect of excess voids in the coarse aggregate is, of course, to require the addition of more sand to maintain workability with a corresponding decrease in compressive strength of the concrete.

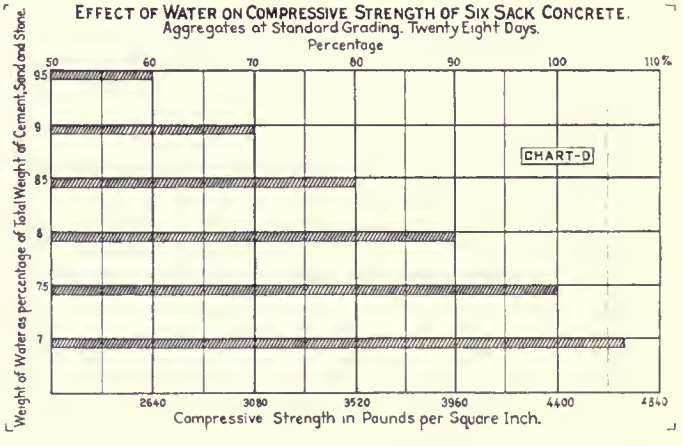
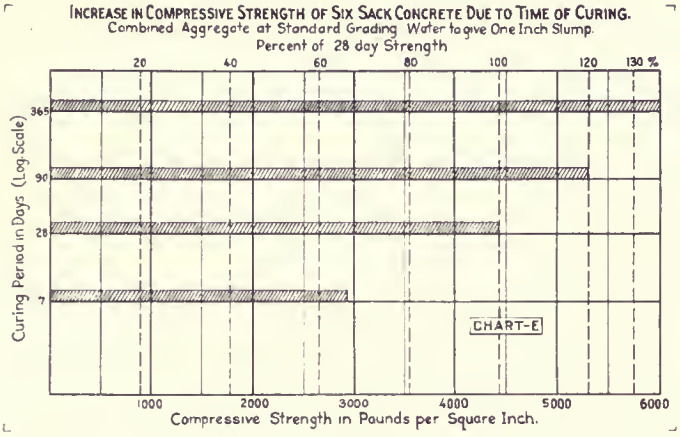

EFFECT OF WATER ON COMPRESSIVE STRENGTH OF SIX SACK CONCRETE.
Aggregates at Standard Grading. Twenty Eight Days.
Percentage
50 60 70 80 90 100 110%
9.5 9 8.5 8 7.5 7
Weight of Water as percentage of Total Weight of Cement, Sand and Stone.
CHART-D
2640 3080 3520 3960 4400 4840
Compressive Strength in Pounds per Square Inch.

CHART D. This table shows effect of water on compressive strength and is founded on tests in our own laboratory, on tests in Bulletin No. 58 of the Bureau of Standards, and on tests by Prof. Abrams.

CHART E. This chart shows increase in compressive strength with increased time of curing. The values shown will

vary more with conditions than those given in other tables. In this instance the values are based on mean temperatures of 70° or higher. Lower temperatures will retard curing time.



MAINTENANCE CREW COMMENDED BY USER OF HIGHWAY

BY THE establishment of a system of maintenance stations throughout the state, quick action is possible whenever an emergency arises at any point on the state highway system. This fact was demonstrated recently when crews of Division VI made repairs on the Cholame lateral following severe storms in that section. The work was so well done that it elicited the following comment in a letter from a user of the highway:

SAN JOAQUIN LIGHT & POWER CORPORATION.
Fresno, California.
March 15, 1926.

Mr. J. B. Woodson,
Highway Commission Engineer,
Rowell Building,
Fresno, California.
Dear Mr. Woodson:

On last Friday, I was traveling between Paso Robles and Bakersfield, and when I arrived at the foot of the Cholame grade, some trouble developed in the motor of my automobile, and it was necessary for me to progress very slowly until I arrived at Lost Hills.

While moving along at this very slow rate of speed, I was well able to observe the excellent condition of the road, and was much impressed with the work accomplished by your local crew, in so short a time after the severe storm in that area.

I thought it proper that the evident efficiency of that particular crew be called to your attention.

Very truly yours,

A. M. FROST,
Manager of Sales,
By (Signed) M. P. LOHSE.

Father (to daughter after examining her expense account): "Do you think silk stockings are absolutely necessary?"
Daughter: "Certainly, up to a certain point."

Lecturer—"Now for a few minutes, ladies and gentlemen, we shall consider the fundamental principle of architecure. The Tuscans—"

Voice from the rear—"How d'ye build a doghouse?"

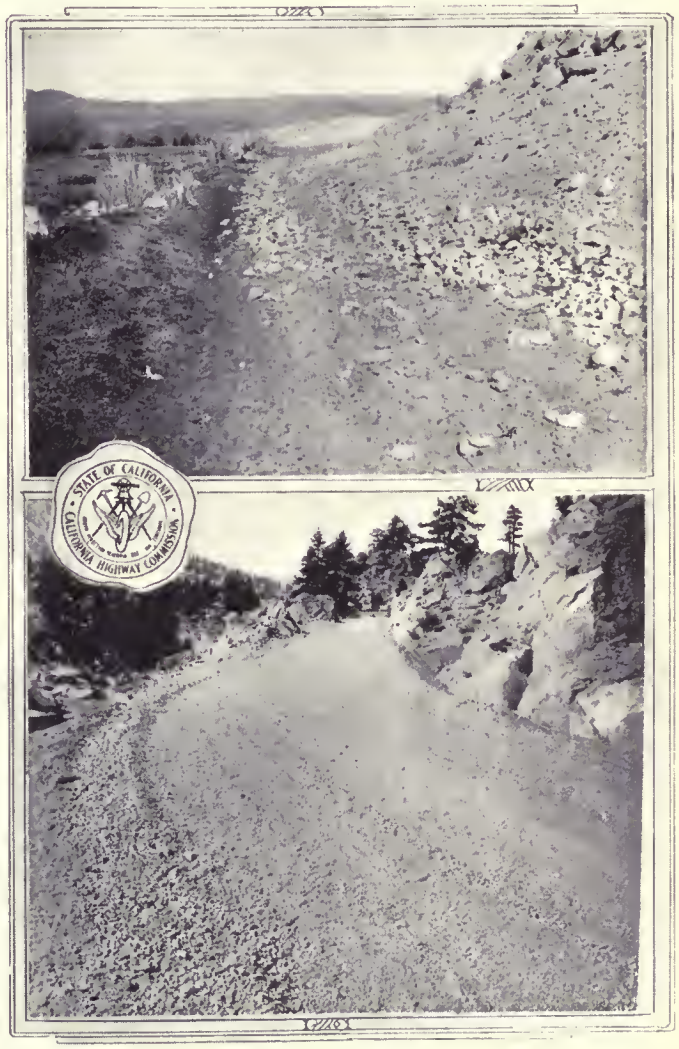
Lecturer (promptly)—"Do you contemplate moving, sir?"—*Boston Transcript.*

HOUSE COMMITTEE FAVORABLE TO NEW FEDERAL AID BILL

THE Dowell bill authorizing federal aid appropriations of $80,000,000 for each of the fiscal years 1928 and 1929 was favorably reported to the House of Representatives by the Committee on Ways and Means supported by the Committee on Roads. The prompt action of the committee is gratifying to friends of federal aid throughout the country. It must be supported in its action. With this in mind, there is published below for the benefit of the civic organizations of the state the entire membership of Committee on Roads which has the legislation in charge:

C. C. Dowell, Iowa, chairman; J. M. Robison, Kentucky; Clarence MacGregory, New York; Charles Brand, Ohio; J. J. Manlove, Missouri; Don B. Colton, Utah; W. H. Sproul, Kansas; W. P. Holaday, Illinois; H. L. Bowles, Massachusetts; J. L. Hooper, Michigan; C. J. Esterly, E. N. Carpenter, Pennsylvania; J. M. Nelson, Wisconsin; E. B. Almon, Alabama; W. J. Sears, Florida; C. B. Hudspath, Texas; Frank Gardner, Indiana; Clarence Cannon, Missouri; G. C. Peery, Virginia; Elmer Thomas, Oklahoma; B. E. Kemp, Louisiana.

There is little opposition to the federal aid appropriation in the house; it is in the senate that the friends of federal aid must muster their forces. Every friendly senator must be urged to stand firm when the matter comes to an issue in the near future.



EAST OF THE SIERRA—*Above*, the old county road on the route of the state highway in Inyo County; *below*, the grade of the new state highway in the same vicinity, traffic conditions greatly improved. (Photos by Div. IX.)

DOWELL SAYS FEDERAL AID SUPPORT NEVER MORE GENERAL

SUPPORT for appropriations for the continuation of construction of the federal aid system of highways was never more general than it is today. So declared Representative C. C. Dowell of Iowa, chairman of the Committee on Roads, in reporting favorably to the House of Representatives the pending bill authorizing appropriations for the fiscal years ending June 30, 1928, and June 30, 1929.

The report of Chairman Dowell is as follows:

"The Committee on Roads, to which was referred the bill H.R. 9504, begs leave to report it has had this legislation under consideration, has held extensive hearings thereon, and has directed me to report the same to the house with the recommendation that the same do pass.

This bill provides for an authorization of $75,000,000 for the fiscal year ending June 30, 1928, and the sum of $75,000,000 for the fiscal year ending June 30, 1929.

The bill also provides authorization in the sum of $7,500,000 for forest roads and trails for the fiscal year ending June 30, 1928, and the sum of $7,500,000 for the fiscal year ending June 30, 1929.

These authorizations are identical with the authorizations provided in the legislation enacted in the Sixty-eighth Congress except that the authorizations in the Sixty-eighth Congress provided for the fiscal years 1926 and 1927. The present bill extends this same authorization to the fiscal years 1928 and 1929.

The committee, in this report, is pleased to advise the house that never since the organization of this committee has there been such general support for this legislation. In fact, during the hearings there have been before the committee, favoring this legislation, representatives of the following organizations with duly authorized statements from their several organizations:

1. American Association of State Highway Officials.
2. American Automobile Association.
3. American Bakers Association.
4. American Farm Bureau Federation.
5. American Federation of Labor (by resolution filed).
6. National Grange.
7. American Road Builders Association (by resolution filed).
8. National Automobile Chamber of Commerce.
9. The Chamber of Commerce of the United States.

The Bureau of Roads and the Forest Service of the Department of Agriculture also appeared before the committee and gave very exhaustive statements concerning the handling of the federal funds, the condition of construction on the federal highway system, and the cooperation between the federal government and the several state highway departments, concerning the entire administration of the Federal Highway Act, including extensive investigations and research relative to the benefits derived from the federal highway system."

FORETHOUGHT IN BRIDGE DESIGN PROVES A MONEY SAVER

(From the February Issue of Successful Methods.)

THIS is the season of the year when the men in charge of bridge design in the various state highway departments have plenty of time to think up new types of bridges. Actual construction work is at a standstill in most states and they are free to devote their minds to devising ways of meeting the needs of their states so far as the construction of highway bridges is concerned.

A short while ago the California Highway Commission was planning a concrete bridge across Alamitos Bay and foreseeing the necessity of permitting a dredge to pass through the bridge at some future time constructed the center span in such a way that it could be removed.

This forethought proved its value later on when the city of Long Beach decided to send a dredge up the bay in order to construct its recreation park. By harnessing the power of the tides through the use of a floating barge, the center span of the bridge, 46 feet long and 26 feet 10 inches wide, was removed in order to let the dredge pass through and then replaced.

As a result of this planning in constructing the removable span, the Highway Commission succeeded in moving and replacing the span at the small cost of $500 and the entire job was done with such dispatch that the bridge was closed to traffic only five hours.

SEAWALL EFFECTIVE AGAINST BATTERING OF WAVES—*Left,* waves hurled fifty feet into the air after striking the new seawall on the Ventura coast during recent storm. It will be noted concave surface of wall has turned back bulk of the water. *Right,* damage done by storm on section unprotected by seawall. Track is contractor's industrial railroad. Seawall designed and under construction by Bridge Department.

J. B. WOODSON RESIGNS POST AT FRESNO; HAS RECORD OF FOURTEEN YEARS SERVICE

WITH a record of more than fourteen years of faithful service to his credit, Division Engineer J. B. Woodson, of Division VI, headquarters Fresno, resigned his position with the highway department on March 19th, effective April 1st.

The resigning engineer is one of the "old timers" with the Commission, having entered the state service on January 1, 1912, the day the original engineering staff took office.

J. B. Woodson.

Mr. Woodson has held the position of division engineer at Fresno for the entire period of his service, during which he supervised the building of the original pavement through the San Joaquin Valley and the lateral roads extending east and west. His most important recent activity has been the planning of the new highway entrance to Yosemite Valley through the Merced canyon.

Maintenance has been one of Woodson's hobbies. He was one of the first to advocate a system of permanent maintenance stations with state-owned homes for maintenance foremen. This system has been extensively developed in Division VI.

Mr. Woodson, it is understood, will enter private practice with headquarters in Los Angeles.

Mr. Morton's Letter.

The resignation was officially accepted by Mr. Morton in the following letter:

March 22, 1926.

Mr. J. B. Woodson,
Division Engineer,
Fresno, California.

Dear Sir:

I have your letter of resignation dated March 19th, and wish you to know that it is with sincere regret that we receive confirmation of your previously expressed intention to leave the State Highway Commission's service.

Viewed from the angle of the headquarters office and from that of the Highway Commissioners themselves, your administration of the affairs of your division has always been most gratifying. Differences of opinion have seldom existed between you and this office, and when they have you have often convinced us that your position was right rather than ours.

You have the best wishes of the highway department in your new work. The Commissioners individually have all expressed regret that you have decided to leave.

With best wishes for your success in your new work, I remain

Very truly yours,
(Signed) R. M. MORTON,
State Highway Engineer.

CALIFORNIA HIGHWAYS GOES TO ELEVEN FOREIGN COUNTRIES.

Copies of California Highways, the official bulletin of the California Highway Commission, are now being mailed to eleven foreign countries. In almost every instance the recipient is an engineer who has visited California to inspect highway construction and who has requested that he be sent the bulletin.

The list includes Australia, Italy, Canada, Chile, Egypt, England, Japan, Mexico, New Zealand, France, and Sweden.

Fond Mother: "Yes, Genevieve is studying French and algebra. Say 'Good Morning' to the lady in algebra, Genevieve."

NEW SECTION OF TAHOE-UKIAH ROUTE—Graded and surfaced highway west of Williams, Colusa County, Division III.

TAXPAYER COMMENDS WORK

EMPLOYEES of the California Highway Commission are always glad to know that their efforts meet with the approval of the public, particularly taxpayers who furnish funds for building and maintenance of the highways.

Division III recently completed the construction of a section of the Tahoe-Ukiah state highway west of Williams, Colusa County. A large property owner of that section has forwarded the following comment to the division headquarters:

J. W. FORGEUS,
Spring Valley Ranch,
Williams, California.

February 20, 1926.

Mr. F. W. Haselwood,
Sacramento, California.

Dear Sir:

I want to compliment you on the gravel highway leading west of Williams. I think I like it as well as any road in the state. Your man Forrest has been a good man on the roads.

I am a large taxpayer and have taken an interest in state highways from the start. I like to see men like Forrest on the job.

Yours very truly,
J. W. FORGEUS.

WIDE RIGHTS OF WAY APPROVED

(From the Inglewood *News.*)

THE State Highway Commission should be commended for its decision to use every effort to induce communities and counties to make their highways at least eighty feet, preferably a hundred, wide.

By planning such highways through the hot and dusty valleys, for example, it will be possible to provide shade and a boulevard. The safety of a shaded boulevard, especially where a railroad track is adjacent, is worth a vast sum to human life and property. Farms along such a highway should have much greater value.

It is reported that some men give the right of way generously but others haggle. The Commission has adopted a plan of offering from two to three times the assessed value of the property. If the offer is refused, condemnation suits follow.

California will certainly be wonderful when the plans in mind are realized. We hope there may be much cooperation on the part of landlords and landowners.

MAINTENANCE FUNDS WILL REPAIR SOUTH COAST HIGHWAY

NORTH OF SANTA MONICA—The entire beach line was changed in places along the south coast by recent storms, the worst in fifteen years. Permanent repairs to the state highway probably will cost several hundred thousand dollars. The views show conditions north of Santa Monica, Los Angeles County. *At the right,* receding storm still battering the shoulder which has been washed away to the edge of the concrete pavement; *Lower left,* maintenance crew unloading material for emergency repairs; *Upper left,* rock and bags of sand placed to protect highway embankment: *Center,* waves dashing against highway grade.

ONE OF the most severe storms since the beginning of state highway construction struck the southern California coast on February 12th and 13th, when a combination of extreme high tides and storms on the ocean caused the worst damage recorded in fifteen years. The estimated cost of replacements and repairs is nearly a quarter of a million dollars, which will come from the motor vehicle and gasoline tax funds.

Damage Summarized.

The following is a summary prepared by Division VII of the damage done at various points:

SAN DIEGO 2-A—South of Cardiff, San Diego County, where the highway is adjacent to the beach, high tides threw considerable seaweed over the pavement and washed out the shoulders. The cost of repairing the damage and making this section safe will be $17,000.

ORANGE 2-A—A cloudburst occurred in the hills in the vicinity of Capistrano, in Orange County, and in some places near Galivan flood water crossed the highway to a depth of three feet. The damage, however, was light considering the amount of water crossing the highway and amounted to about $1,000.

ORANGE 60-A—Along the coast in Orange County, between Sunset Beach and Huntington Beach the waves washed over the Pacific Electric railroad tracks and flooded down across the state highway, cutting out 6000 cubic yards of embankment and 600 tons of oil-cake shoulder that had been placed along the concrete pavement. Damage here amounted to approximately $5,000.

LOS ANGELES 60-B—Along the paved highway northwesterly from Santa Monica the damage was most spectacular due to the fact that about seventy-five cottages built between the highway and the ocean were destroyed by the huge waves and the shore line strewn with wreckage. About 50,000 cubic yards of embankment were carried away, 30,000 of which will have to be replaced to give the required 10-foot shoulder, and about 6500 tons of riprap rock will be required to protect the new embankment. $38,000 has been allotted to repair this section.

LOS ANGELES 60-A—As a result of the storm along the coast highway through the Malibu ranch an estimated expenditure of $70,000 will be required to replace the damage done and to protect against further damage by ocean.

VENTURA 60-A—Along the Hauser contract close to 50,000 cubic yards of slides have occurred and considerable embankment washed out. It is estimated $100,000 will be required to remove slides, replace embankments, and protect the new fills with riprap rock.

The storm did other damage in Division VII but it was of minor importance compared with that listed above.

PIERCE SUCCEEDS McLEOD AS ACTING HEAD OF DIVISION X

THE PROMOTION of R. E. Pierce from assistant division engineer to acting division engineer in charge of Division X is announced by State Highway Engineer R. M. Morton, effective as of March 1st. The new acting division engineer succeeds J. C. McLeod, who resigned to accept a partnership in the contracting firm of Force and Currigan of Oakland.

R. E. Pierce.

The resignation of Mr. McLeod was followed by other promotions in Division X as follows:

L. E. McDougal, office engineer, to be assistant division engineer;

Clarance Bovey, maintenance superintendent at Stockton, to be assistant division engineer in charge of maintenance;

F. C. Hewitt, resident engineer, to be maintenance superintendent at Stockton succeeding Mr. Bovey.

Has Long Record.

Except for the period when he served as First Lieutenant of Engineers during the war, the new head of Division X has been on the staff of the Commission since 1915. He served as resident engineer and assistant engineer in Division III prior to the organization of Division X, when he became assistant division engineer in charge of maintenance. He is president of the Sacramento Chapter of the American Association of Engineers.

Mr. McDougal has been an employee of the Commission since 1919. He will be in charge of the office during the absence of Mr. Pierce and will devote his time to the supervision of construction work.

Mr. Bovey is another of the "old timers" with the California Highway Commission, having been a member of the engineering staff since 1912. For a number of years he was resident engineer under G. R. Winslow.

Mr. Hewitt was with the Commission prior to his service with the army in France, and later was engineer for the National Park Service in connection with the location of roads in Lassen Volcanic National Park. He has been resident engineer with Division X for the last two years.

The resignation of Mr. McLeod, who came to California two years ago from the Oregon highway department, is regretted by the entire department and by members of the Commission and Mr. Morton. Mr. McLeod has been active in planning numerous important reconstruction projects throughout Division X several of which he carried to completion. His work gained for him not only the confidence of his superiors, but that of the people of his district as well. All join in wishing him success as a member of the new firm of Force, Currigan and McLeod, engineers and contractors.

Two chance acquaintances from Ireland were talking together.

"An' so yer name is Riley?" said one. "Are yez any relation to Tim Riley?"

"Very distantly," said the other, "Oi was me mother's fust child, an' Tim was the tinth."

An American friend just over from the States dropped in to the *Passing Show* office with the latest joke on the American passion for standardization. A man was being questioned by an employer on his suitability for a fairly important job as a mechanic.

"But," said the employer, "are you an all-round man—a thoroughly-trained mechanic?"

"Oh, yes," the man assured him; "for six years I had experience at the Ford works."

"And what did you do there all that time?"

"Well," said the man, "I screwed on nut 467."

—*The Passing Show (London.)*

MOTORIST WHO HIT MAINTENANCE MAN PAYS $240 FINE

MAINTENANCE men employed by the California Highway Commission often risk their lives in the service of the public and are entitled to protection of the law. This fact was brought forceably to the attention of a Los Angeles broker recently, when he was brought before the justice court at Newhall and fined $240 on a charge sworn to by Division Engineer S. V. Cortelyou.

The charge was the result of an incident which took place on the state highway two miles south of Newhall. Four members of a maintenance crew were patching the pavement, when a car came up on the wrong side of the highway. The driver drove through the new patch and knocked down one of the men before bringing his car to a stop.

County Authorities Cooperate.

When remonstrated with, he drew a revolver, threatened to kill any who got in his way and drove off. The number of the car was secured and a warrant sworn to immediately. The following letter tells of the splendid cooperation accorded the division by the authorities of Los Angeles County:

COUNTY OF LOS ANGELES.
SHERIFF.
Criminal Department.
Los Angeles, California.

March 10, 1926.

Mr. S. V. Cortelyou,
Division Engineer,
California Highway Commission,
Los Angeles, California.

Dear Sir: Subject _____

I have your communication of March 1st, directed to Constable Bitterson at Newhall, relative to the actions of the above subject and the controversy he got into with your men employed on the road near Newhall.

Please be advised that his warrant was sent to me for service, and I immediately detailed deputies on same, with the result that this defendant was arrested and taken before Judge Arthur Perkins at Newhall, WHERE HE WAS SEVERELY LECTURED AND FINED $240.

I believe that this has taught him a lesson, and I do not think that in the future you will have any trouble whatsoever from this particular defendant.

I trust that this meets with your approval, and at this time I wish to say that any time your men have any trouble of this nature, if they will get a warrant and report same to this office, we will exert every effort to take these men into custody and have them fined. We desire to cooperate with you in the fullest extent in the maintenance of our good roads.

Very respectfully,

WILLIAM I. TRAEGER, Sheriff.

NEAR SAN JUAN—Recent storm damage to the state highway grade requiring expenditure of maintenance funds for replacing shoulders.

WHAT THE DIVISIONS ARE DOING

DIVISION I.

HEADQUARTERS, WILLITS.

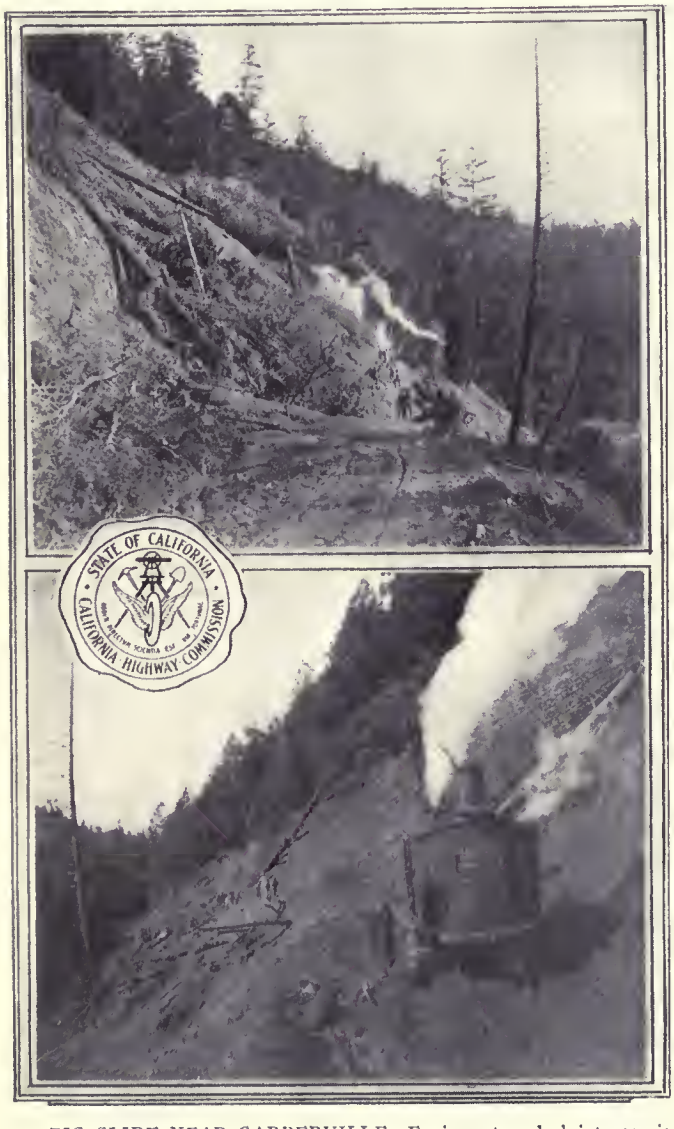
T. A. BEDFORD, DIVISION ENGINEER.

Counties of Del Norte, Humboldt, Mendocino, and Lake.

SLIDE removal continued an important activity of Division I during the month. For a period of ten days the road was blocked to traffic south of Eureka by slides and washouts, the worst in several years. At the big slide, south of Scotia, maintenance crews worked night and day in an effort to open the highway to traffic. Two 1/3-yard power shovels, a large drag line outfit, and a high-pressure pump were used two shifts daily to remove debris that came down the mountain with this slide. It is estimated that 15,000 cubic yards of earth and rock already had been removed from the roadway at this point.

A recent rainfall record at Willits showed a precipitation of fifteen inches in eighteen days. Twelve inches fell during one period of eight days. The large number of slides and the blocked condition of culverts testifies to the severe winter.

Authorization has been received for the placing of considerable guard rail at various points on the Redwood highway to promote the safety of the road.



BIG SLIDE NEAR GARBERVILLE—Equipment rushed into service by Division I to open Redwood highway following recent storms. Thousands of dollars of maintenance funds will be required for slide removal in this division.

Maintenance Station Site Purchased.

A desirable site for a maintenance station has been acquired at Boonville, Mendocino County, on the Navarro River highway. It is two acres in extent and was purchased for $300, of which $100 was donated by business men of Boonville. The price is considered very reasonable.

Operations are progressing at the convict camp on Smith River. Some damage to the new grade was done during the period of high water which may require some revision of plans for the protection of grade slopes during winter months.

DIVISION III.

HEADQUARTERS, SACRAMENTO.

F. W. HASELWOOD, DIVISION ENGINEER.

Counties of Butte, Colusa, El Dorado, Glenn, Nevada, Placer, southern Plumas, Sierra, Sutter, Yuba, and northern Sacramento and Yolo.

MAINTENANCE of a large mileage of county roads taken over by the Commission on January 1st is now well under way in Division III. The results to date are encouraging, for it is evident the division will be able to accomplish more with the funds allotted than was anticipated. The new situation has resulted in several changes in personnel and location of maintenance crews. Division III now has seventeen maintenance superintendents and foremen employed, stationed at as many different points throughout the division.

Truckee Canyon Contract Accepted.

Grading in the Truckee River canyon is progressing steadily. The Irey and Holden contract for work between Boca and Floriston, Nevada County, including the Hinton extension, has been completed and accepted. The cost of grading this 5.3 miles was approximately $328,000.

On the remaining section, Floriston to the Nevada line, 6 miles, 3.5 miles have been completed to date by the Nevada Contracting Company. The coming of spring is expected to enable the contractor to speed up the work. The division is anxiously awaiting news that the big power shovel doing the advance grading has "broken through" at the point where the Nevada road now ends.

Painting of timber trestles recently completed in Butte and Glenn counties is now under way and placing of asphalt concrete floors will be started in the near future.

Joseph Birkett has completed the placing of 610 lineal feet of 8-foot by 6-foot cement concrete pavement widening at one of the entrances to Grass Valley. This improves a street where car tracks recently were removed.

The old wooden causeway between the American River and the Globe Iron Works, North Sacramento, has at last been removed with the final completion of the new ground level pavement. Riprap has been placed along the outer sides of the levees protecting the two subways which were a part of the improvement.

Storage buildings for maintenance equipment have been completed at Marysville and Colfax. A foreman's cottage is under construction at Marysville.

Surfacing is under way at various points between Placerville and Camino and at points on the Mother Lode highway north and south of Placerville.

Slides Removed.

Slides have been removed from the new section of the Victory highway between Colfax and Gold Run.

The division is cooperating with the Glenn-Colusa Irrigation District in the construction of a drainage ditch which borders the west side of the highway for 2.65 miles between Logandale and Willows, Glenn County. The fence line will be moved back and

the spoil from the ditch utilized to build up the earth shoulders along the highway. About 20,600 cubic yards of material will be moved.

NEAR NEWPORT BEACH—High seas washed over the Pacific Electric tracks shown at right above and scoured away shoulders of the south coast highway. The concrete pavement was not damaged by the unprecedented storm. Motor vehicle funds will repair damage.

DIVISION V.

HEADQUARTERS, SAN LUIS OBISPO.

L. H. GIBSON, DIVISION ENGINEER.

Counties of San Benito, Monterey, San Luis Obispo, and Santa Barbara.

RAPID progress is being made on the Pismo Beach contract on the Coast highway, San Luis Obispo County. The bridge across Villa Creek is practically completed and the overhead crossing of the Southern Pacific railroad is well advanced. Grading is about 40 per cent completed with further progress awaiting completion of the overhead crossing. The main cut, which contains about 75,000 cubic yards, and which is to cut away several hundred feet of existing highway, is completed to the point where it was necessary to remove the existing roadbed. A first-class detour has been graded and graveled to carry traffic for several months, pending completion of the new highway.

A number of houses and other buildings in and near the town of Summerland have been moved to make room for the new Summerland-Ortega Hill highway, and the rough grading through the town is practically completed. The heavy cut over Ortega Hill is more than 50 per cent completed.

Widening Work Progresses.

The Cornwall Construction Company is making rapid progress on the widening of the highway south of Carpinteria, having completed rough grading south of the town and poured the concrete shoulders along one side of the existing pavement.

One of the traversable county roads taken over by the division on January 1st was the road from Carmel to Big Sur River, Monterey County. This picturesque stretch has been somewhat of a bugbear to timid motorists on account of its narrowness, crooked alignment, and steep grades. Division V has a maintenance crew at work bettering drainage conditions, strengthening structures, and improving dangerous points. By next summer, the road will be somewhat safer to drive over than heretofore.

DIVISION VI.

HEADQUARTERS, FRESNO.

J. B. WOODSON, DIVISION ENGINEER.

Counties of Fresno, Madera, Merced, Mariposa, Kings, Tulare, and Kern, north of the Tehachapi.

TWO WIDENING projects on the San Joaquin Valley trunk highway in Kern County recently were completed under the direction of Division VI. They are the Federal Paving Company's job of 8.2 miles between Bakersfield and Lerdo, and a project of one mile, south of Delano, completed by the Warren Construction Company. The old 15-foot concrete base in both instances was widened to 20 feet and thickened with asphalt concrete.

Fresno and Madera counties are taking steps to secure rights of way for the proposed reconstruction of the state highway across the San Joaquin River at Herndon, at the boundary of the two counties. Building of a badly needed new bridge on the west side of the Southern Pacific railroad and the placing of a short section of new pavement will eliminate two grade crossings and a number of dangerous curves.

City and State Cooperate.

The city of Fresno and the Commission are cooperating in the widening of the pavement at the southern entrance to Fresno. The completion of the project will provide a section of pavement 40 feet in width.

The widening of 2.8 miles north and south of Delano is a Division VI project which, it is expected, will be under way in the near future.

DIVISION VII.

HEADQUARTERS, LOS ANGELES.

S. V. CORTELYOU, DIVISION ENGINEER.

Counties of Los Angeles, Ventura, Orange, San Diego, and eastern Kern, south of Mojave.

WITH pretty co-eds from Whittier College letting down the barriers, the final unit of the Los Angeles-Whittier boulevard was opened to traffic recently with a large crowd of local residents and officials present and participating. Leaders in the dedication of the new section of state highway were Commissioner Nelson T. Edwards, Mayor W. B. Green of Whittier, Mayor M. R. Parmelee of Montebello, and Fred Beaty, president of the East Side Association.

In addition to the new section of 3.5 miles of pavement, 56 feet wide, the opening of the new subway under the tracks of the Union

(Continued on next page.)

NEW MAINTENANCE STATION—Foreman's cottage and warehouse for equipment near El Rio, Ventura County, Division VII.

DIVISION REPORTS

(Continued from page 13.)

Pacific railroad and the completion of the new reinforced concrete bridge over San Gabriel River also were celebrated.

The new highway from the Los Angeles city limits to Whittier is now a 56-foot pavement for practically the entire distance between the two municipalities. Los Angeles County and a local improvement district cooperated with the state in financing the project, an important section of the Los Angeles-San Diego highway and one of the heaviest traveled state highways. It is on the route of the El Camino Real connecting the early missions.

San Onofre Line Change in Use.

Traffic is now using the San Onofre-San Mateo Creek line change on the Coast highway in San Diego County. The new location shortens the distance two-thirds of a mile and eliminates sixteen curves, at two of which numerous fatal accidents have occurred. The heavy fill necessary to make the change has not been paved, but will be surfaced with crushed rock until after settlement has taken place. Two handsome bridges across the two creeks have been completed by the bridge department.

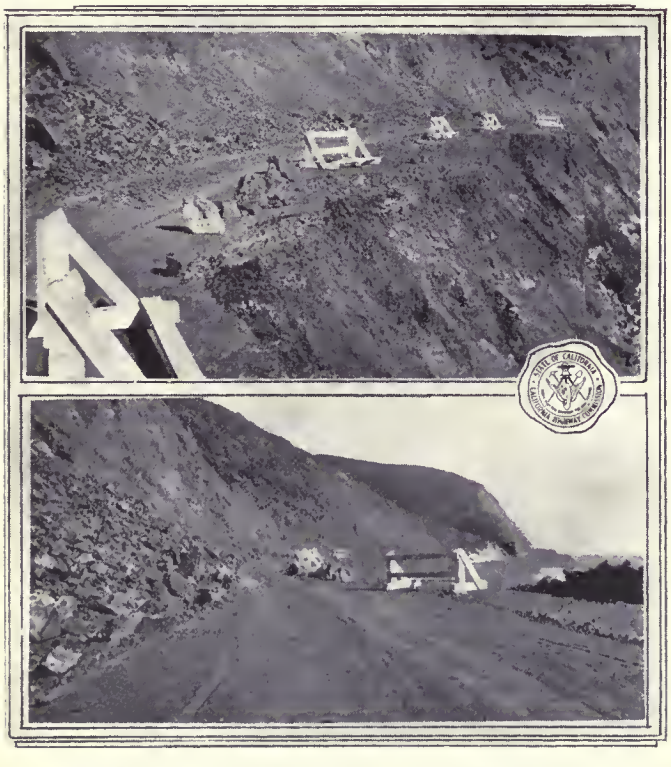
Orange County Paving Progresses.

Between Newport Beach and Corona Del Mar, on the South Coast highway, the subgrade is ready for concrete pavement. From Corona Del Mar to Laguna rock for asphalt macadam is now in place.

Widening of the fifteen-foot pavement on the Foothill boulevard to twenty feet by the addition of cement concrete shoulders has been completed from San Fernando to Tujunga, except at the line change in the vicinity of Big Tujunga Wash where grading is in progress.

Over two miles of "second-story" concrete pavement has been placed on the contract for reconstructing the state highway between Camarillo and Ventura.

Paving with cement concrete is now under way on the Coast highway through the Malibu ranch. This work was commenced at Las Flores Canyon and will be continued to Latigo Creek, a distance of nearly seven miles.



ON THE HAUSER CONTRACT—Wave action during recent storms seriously damaged sections of the new grade on the Ventura coast which will require large quantities of heavy riprap for protection. Emergency appropriations already have been made.

DIVISION VIII.

HEADQUARTERS, SAN BERNARDINO.

E. Q. SULLIVAN, DIVISION ENGINEER.

Counties of San Bernardino, Riverside, and Imperial.

DIVISION VIII was honored recently by a visit from Governor Friend Wm. Richardson, who made a trip of inspection over the National Old Trails from San Bernardino to Topock and also over the Mecca-Blythe highway in Riverside County. In an address at the National Orange Show, he emphasized the great improvement that had been made on these two roads since his first trip three years ago, prior to the commencement of state maintenance.

The snowfall along the state highway in the San Bernardino mountains this winter was the heaviest in four years. At Big

SNOW IN SOUTHERN CALIFORNIA—Equipment of Division VIII bucking snow on the Rim of the World highway near Big Bear Lake in the San Bernardino mountains. *Left,* tractor pushing snow plow; *Right,* trucks working in tandem pushing scraper.

Bear Lake, the depth was thirty inches on the level and in recent weeks there was still snow on the ground. Division VIII's snow removing equipment was given considerable service.

Brawley-Imperial Grading Finished.

Grading of the highway between Brawley and Imperial has been completed and the water-bound macadam surfacing has made this section a speedway for motorists. Oiling of the macadam has been authorized and will be under way in the immediate future.

The placing of cement concrete shoulders between Edom and Indio, Riverside County, has been completed, widening the existing pavement from 16 to 20 feet. Sand shoulders through this section made the concrete shoulders necessary.

Sand Hill Paving Under Way.

The building of the grade for the placing of an asphalt concrete pavement across the Sand Hills on the El Centro-Yuma connection, in Imperial County, is now well under way. A drag line outfit is being used for the construction of the high fill upon which the pavement will be placed.

Grading between Hicks and Daggett, in San Bernardino County, is practically completed and production of material for placing of a crushed rock surfacing has been begun.

DIVISION X.

HEADQUARTERS, SACRAMENTO.

R. E. PIERCE, ACTING DIVISION ENGINEER.

Counties of Amador, Calaveras, Alpine, Tuolumne, Stanislaus, San Joaquin, Solano, and southern Sacramento and Yolo counties.

AN IMPROVED entrance to Sacramento from the west is nearer realization as the result of the award of a contract to the H. V. Tucker Company of San Francisco for the building of a roadbed from the west end of the M street bridge to the new West Sacramento subway, in West Sacramento. The new subway has been finished and grading of the roadway will be followed by a paving project. The work is well under way.

Bids have been asked for the widening and resurfacing of 7.8 miles from Modesto to the Stanislaus River in Stanislaus County. This will be the most important reconstruction project of the year for Division X.

Location Survey Under Way.

A location survey between Sonora and Pulleys, to a connection with the recently completed Forest highway project in Tuolumne County, is nearing completion under the direction of F. C. Hewitt.

Division X is now actively engaged in improving sections of the Mother Lode highway within the division under the new maintenance program recently inaugurated by the Commission. Later in the spring, several specific betterments will be undertaken on the trans-Sierra roads of the division.

Authorization has been received for the repair of twelve bridges located in San Joaquin and adjoining counties.

SOUTHERN PROJECTS PRAISED

DIVISION VIII at San Bernardino has received the following letter commenting on two paving projects recently completed in San Bernardino and Riverside counties:

PORTLAND CEMENT ASSOCIATION,
548 South Spring street,
Los Angeles, California.

Mr. E. Q. Sullivan,
Division Engineer,
San Bernardino, California.

Dear Mr. Sullivan:

Recently I had the pleasure of riding over your two concrete highway jobs completed in 1925. I have reference to the Beaumont-Redlands road as well as the second-story work from San Bernardino to Redlands, both contracts completed by Basich Brothers.

I want you to know that in my opinion these two projects are as smooth-riding roads and apparently as good construction any that I have noticed in Southern California. Both yourself and Mr. Young, your resident engineer, are to be congratulated on the first-class construction that you obtained on these two roads.

This letter is not intended to disparage the work of any of the other division engineers or make any comparison as I am sure they are all doing good work, but I was so pleased with these two jobs that I wanted you to know how I felt about them.

With kindest regards, I am

Yours very truly,
(Signed) J. E. JELLICK,
District Engineer.

Camera Lost.

L. D. Packard is seeking the party who borrowed a Bridge Department camera and who so far has neglected to return it.

Scotchman to Caddy: "Are you good at finding balls?"
Caddy: "Yes, sir!"
Scotchman: "Well, go find one and we'll begin."

DEL NORTE SUPERVISOR LIKES WORK OF MAINTENANCE CREWS

THE RECENT winter has been a trying time for maintenance crews on the Redwood highway. The heavy downpour of rain that continued for weeks resulted in numerous slides at many points along the route and at times it was impossible to keep the road open for traffic south of Eureka. In Del Norte County by strenuous efforts serious delays to traffic were obviated.

Supervisor W. A. Fleming of the Fifth Del Norte District has forwarded headquarters a clipping from one the Crescent City papers, expressing the desire that the item be published in *The Bulletin* in appreciation of the work of the Division I forces.

The article reads as follows:

Highway Foreman Given Credit For Efficient Work.

Residents of this county have been heaping much praise upon the shoulders of J. W. Ross, the efficient foreman of highway maintenance under Superintendent J. J. Stockard of Div. No. 1 of the California Highway Commission.

Ross has charge of the maintenance of the highway from the Klamath River north to the Winchuck River at the state line, a distance of 47 miles. Ross deserves great credit for the able manner in which he has handled the road situation in the face of the recent heavy storms.

Although there were numerous slides on the highways and many trees down across the road, none of them caused serious traffic delays due to the untiring efforts of Ross and his crew to clear away the debris. The only real delay of the season was the high water at the Klamath River, which prevented the operation of the ferry.

That's More Than Some Get.

I sent my boy to Yale
With a pat upon the back;
I spent ten thousand dollars,
And got a quarterback.

There was a young lady named Eleanor,
Whose auto turned over and feloner;
'Twas ten minutes or so
Ere she seemed to know
The things that the people were 'teleanor.

Little Johnny, a city boy, in the country for the first time, saw the milking of a cow.

"Now you know where the milk comes from, don't you?" he was asked.

"Sure!" replied Johnny. "You give her some breakfast food and water and then drain her crankcase."

HIGHWAY NEWS NOTES

"SAFETY on the Highways" was the subject of a paper presented by State Highway Engineer R. M Morton before the annual convention of the County Supervisors' Association in San Diego on March 12th. Mr. Morton also appeared before the convention of county engineers. Other engineers of the department who presented technical papers before the latter body were C. S. Pope, C. L. McKesson, and Fred J. Grumm.

Assistant State Highway Engineer T. E. Stanton has completed an inspection of state highway projects throughout the southern counties.

W. F. Faustman has been transferred from Division III to the headquarters drafting office.

H. R. Church, resident engineer, has been transferred from Division III to Division V.

Benjamin Thomas, assistant resident engineer, formerly with Division X, is now on the staff of Division VII.

Arthur Wallace of Division X is now with Division VI.

H. T. Avery, office engineer, is the proud daddy of a son whose arrival broke the continued birth of girls in Division V.

Ralph C. Wright and J. F. O'Hara, draftsmen, Division VIII, are among the new fathers of the past month.

STATE HIGHWAY FUND CONTRACTS (Bond Funds, Including Federal Aid)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE FEB. 8, 1926.						
445	III	Nevada	38	B	Boca to Floriston	5.72	Grading	Irey and Holden	$318,688 60	July 16, 1924	
467	VII	San Diego	2	D	Across San Mateo Creek		Reinf. Concrete Bridge	R. A. Wattson	84,135 38	June 3, 1925	
477	VIII	Riverside	26	E	Coachella Stormwater Drain		Reinf. Conc. Girder Bridge	Badt, Falk and Bergendahl	42,181 88	July 29, 1925	
					AWARDED SINCE FEB. 8, 1926.						
494	VI	Mariposa	18	E	Across Bear Creek at Briceburg		Reinf. Conc. Girder Bridge	Smith Bros. Co.	$29,045 03	Mar. 17, 1926	150
495	VI	Mariposa	18	E, F	Across State Gulch and Sweetwater Creek		Two Arch Span Bridges	Noble Bros.	23,046 75	Mar. 17, 1926	100
					Sub-total				$52,091 78		
					PENDING AWARD—None.						
					Total State Highway Fund Contracts Awarded and Pending Award				$52,091 78		

NOTE.—Primary construction covered by the above contracts does not include funds obligated on cooperative forest highway projects, prison camp road activities, or day labor jobs not being done under contract.

Seattle Public Library

STATE HIGHWAY MAINTENANCE FUND CONTRACTS (Including Gasoline Tax Fund)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE FEB. 8, 1926.						
M-67	III	Sacramento	3	B	Sacramento Northern Railroad Crossing		Underpass	Lord and Bishop	$23,319 00	April 15, 1925	
M-73	VII	Los Angeles	2	D	Across San Gabriel River		Reinf. Conc. Girder Bridge	Charles and F. W. Steffgen	104,147 10	May 4, 1925	
M-78	IV	San Mateo	2	A	Cypress Lawn Cemetery to San Bruno	4.39	P. C. C. Widening and A. C. Surface	Federal Paving Co.	243,056 39	May 4, 1925	
M-82	VI	Kern	4	D	Beardsley Canal to Lerdo	8.21	A.C. Pavement and Rock Borders	Federal Paving Co.	175,717 49	May 20, 1925	
M-83	VII	San Diego	2	D	Two miles S. San Onofre to northerly boundary	3.65	P.C.C. Pavement and Std. Surface	R. A. Wattson	142,098 89	June 3, 1925	
M-98	III	Sacramento	3	B	American River to Globe Iron Works	0.42	P.C.C. Pavement	Kaiser Paving Co.	31,615 31	Sept. 3, 1925	
M-104	VII	Ventura	2	F	At Middle Causeway	0.10	Grade and Std. Surface	Edward W. Dahl	14,688 00	Oct. 23, 1925	
					AWARDED SINCE FEB. 8, 1926.						
M-113	II	Shasta	3	C	Across Doney Creek		Arch Span Bridge	Bordwell and Zimmerman	$89,915 63	Mar. 17, 1925	175
M-114	VII	Los Angeles			At Lankershim		Maintenance Shop Bldg.	Hodge and McMackin	20,070 00	Mar. 17, 1925	50
					Sub-total				$109,985 63		
					PENDING AWARD—None.						
					Total State Highway Maintenanee Fund Contracts Awarded and Pending Award				$109,985 63		

NOTE.—The above obligations charged against the State Highway Maintenance Fund do not include funds from these sources obligated for general maintenance and for specific betterments being done under day labor authorization.

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CALIFORNIA HIGHWAYS

A BULLETIN ISSUED BY THE CALIFORNIA HIGHWAY COMMISSION FOR THE INFORMATION OF ITS EMPLOYEES AND THE PUBLIC

Vol. 3 APRIL, 1926 No. 4

NEW PAVEMENT THROUGH MONTECITO—A reconstruction project recently completed on the state highway in Santa Barbara County was the widening and thickening of the county-built pavement through beautiful Montecito. A description of this project will be found on page three. (Photo courtesy Santa Barbara Chamber of Commerce.)

In this issue: PROGRESS ON GRADE CROSSING ELIMINATION—SELECTION OF ROCK AND GRAVEL FOR HIGHWAY CONSTRUCTION.

CALIFORNIA HIGHWAYS

HARVEY M. TOY, Chairman;
N. T. EDWARDS and LOUIS EVERDING, Commissioners.

ROBERT M. MORTON, State Highway Engineer.

W. F. MIXON, Secretary.

We are pleased to permit publication of any of the matter contained herein or to loan cuts, and this privilege is extended newspapers and periodicals without restrictions.

FRANK B. DURKEE - - - Editor
P. O. Box 1103, Sacramento, California.

Vol. 3 APRIL, 1926. No. 4

CALIFORNIA HIGHWAY DEPARTMENT

CALIFORNIA HIGHWAY COMMISSION

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LOUIS EVERDING, Commissioner, Arcata

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EASTERN EDITORS REPUBLISH RESEARCH ARTICLES

FOR several months past California Highways has been publishing a series of articles contributed by Construction Engineer C. S. Pope and Materials and Research Engineer C. L. McKesson, explaining in detail the construction practices now in force on California state highways and the result of research upon which these practices are founded.

In approving this series of articles State Highway Engineer R. M. Morton had several purposes in view. It was his desire that members of the engineering staff of the department, particularly resident engineers in the field, be given complete information concerning the underlying reasons for the specifications which they are required to carry into execution. It was his belief, also, that county and city engineers, and others engaged in public work, might find much of value in the information presented which would benefit them in the planning and execution of highway projects off the state system.

The widespread interest within the highway department and the many commendations received from those outside the organization give assurance that Mr. Morton's hopes have been more than realized.

Approval also has come from another source. Editors of eastern engineering publications have joined those of western states in giving generous space to republication of many of these articles. The work of the California Bridge Department also is attracting attention. Engineering societies have watched with interest the successful consummation of the Klamath River bridge project, thought impossible by some a few years ago.

Commenting on the interest of eastern publications, a western editor says:

> "I note that many of the eastern magazines are reprinting these articles which I consider not only a compliment to the work of these men but a great thing for California, giving this state the lead in another line of development."

The California Highway Department has gathered much valuable information as a result of experience and research. Whatever it can contribute through the Bulletin or otherwise to the counties and the cities, and to others interested, will be gladly given for the benefit of the state.

Judge: So you tried to drive by the officer after he blew his whistle.
Motorist: Your honor, I'm deaf.
Judge: That may be, but you'll get your hearing in the morning. Next case.—Princeton Tiger.

APRIL 1926

California Highways

VOL. 3 No. 4

COUNTY PAVEMENT THROUGH MONTECITO REBUILT BY STATE

COUNTS of traffic on the state highway between Los Angeles and Santa Barbara show a heavy travel, which is steadily increasing. A study of the situation clearly indicates the imperative need of reconstruction of existing pavements and the highway commission recently has authorized several important projects looking to the early completion of a highway of a minimum width of twenty feet between the two cities. Through thickly settled sections of Santa Barbara County, south of Santa Barbara city, it is probable a width of thirty feet will be adopted.

The first of these reconstruction projects to be completed was the widening and straightening of the highway through Montecito, the beautiful and widely known district immediately south of Santa Barbara. For years an oil macadam pavement placed by the county in 1909, and a gift to the state at the inception of state highway construction, has carried this mounting traffic. Maintenance costs were high and the condition of the pavement unsatisfactory. Sharp curves became hazards for the heavy traffic.

Through this congested area the commission has recently completed a thirty-foot pavement, extending from the Santa Barbara city limits southward for a distance of 1.9 miles. Cement concrete shoulders, each 7½ feet in width, were built on either side of the existing oil macadam. These shoulders have an eight-inch edge and a six-inch thickness of center. The fifteen feet of oil macadam was resurfaced and thickened with asphalt concrete. The roadbed was graded practically to the full width of the right of way and the alignment improved at several curves where new rights of way were secured with the cooperation of the county.

Gasoline Tax Pays Bill.

As a result, the Montecito section of the state highway is one of the finest on the Coast route. The work was done by the Cornwall Construction Company of Santa Barbara and was supervised by Division V. E. B. Brown was resident engineer. The gasoline tax paid the bill. A photographic view of the new pavement is reproduced on the front cover.

PROGRESS MADE ON GRADE CROSSING ELIMINATION

By L. D. PACKARD, Bridge Department.

THE RAPID increase in the number of motor vehicles operating on state highways has made elimination of railroad grade crossings one of the important problems confronting the California Highway Commission. This work has been going forward for several years and a number of the most dangerous crossings in the state have been eliminated. It will take many years, however, and a large amount of funds to complete the program.

The commission in 1922, in conjunction with the Bureau of Public Roads and the State Railroad Commission, made a study of existing grade crossings on state highways. A total of 573 crossings were investigated, 446 of which were outside the corporate limits of cities and the remaining 127 within the limits of cities but on state highway routes.

Crossings Classified.

Crossings were classified according to importance as follows:

Class I—Grade crossings possible of elimination by relocation. (This number is indefinite.)

Class II—Crossing of a primary highway and trunk line railway of two or more tracks, 24;

Class III—(a) Grade crossing of a single track line and a primary or trunk highway or of any trunk line and secondary highway, 71;

(b) Grade crossings of a single track line carrying a moderate traffic (not a transcontinental road) and a primary trunk or secondary lateral. Includes important suburban electric railroads, 58;

Class IV—(a) Grade crossings of unimportant single track steam or electric lines on which service is limited and primary trunk or secondary lateral highways, 124;

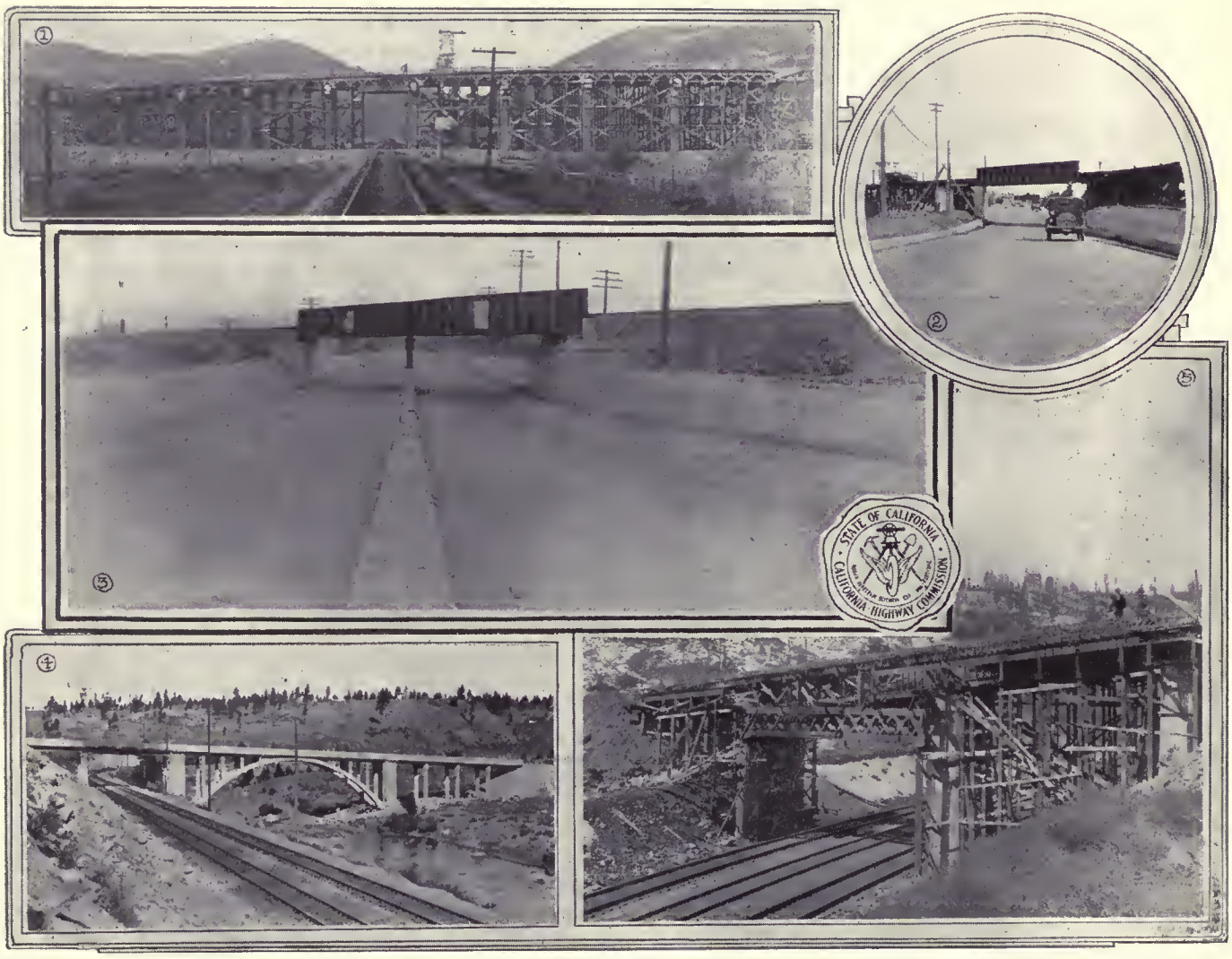
(b) Grade crossings of spur and switch lines with all highways, 114.

In addition to grade crossings, a number of existing subways or overhead crossings are of timber construction or otherwise unsatisfactory as to clearance and alignment and will have to be replaced with modern structures.

The type of elimination is controlled by topographic conditions which necessarily affect cost. In some cases it is possible to eliminate crossings entirely by relocation of the highway, while others will involve a combination of relocation and structures. In some instances eliminations may be made at the existing crossing by means of a subway or overhead structure.

(Continued on next page.)

UNIQUE GRADING PROJECT—Making a fill at West Sacramento. Sand lifted from bed of Sacramento River by bucket dredge is sluiced through flume for building new approach to M street bridge. (Photos by Division X.)



NEW GRADE SEPARATIONS—(1) Concrete structure over Southern Pacific tracks at Pismo, San Luis Obispo County; (2) new grade separations at North Sacramento, second under pass may be seen in distance; (3) Montebello subway on Whittier Boulevard, Los Angeles County; each opening has a clear roadway width of 28 feet for one-way traffic; (4) Polaris bridge over Truckee River and double track of Southern Pacific in Truckee canyon, Nevada County; (5) Hinton Crossing of Southern Pacific in Truckee canyon. (Photos by Bridge Department.)

PROGRESS MADE ON GRADE CROSSING ELIMINATION

(Continued from page 3.)

Projects are Cooperative.

Cost of grade separations is usually borne jointly by the railroad company and the state, but counties and other political subdivisions often are willing to participate. Division of cost among the various participating bodies is affected by features pertinent to particular crossings and frequently is agreed to in advance, but in some instances it is necessary to have the State Railroad Commission determine the matter. In all instances official authorization for the project must come from the Railroad Commission.

The design of structures for grade separations is a duty of the bridge department of the commission. The plans, of course, have to meet with the approval of railroad engineers and the Railroad Commission. Generally the work is done by the state, but sometimes the railroad company desires to construct a portion of a subway or superstructure.

Preliminary steps necessary are numerous and convenience of the public must be considered at all times. It is often difficult to satisfy all concerned, but an earnest effort is being made by the commission to accomplish the greatest good for the traveling public with the least expense to the railroads and damage to adjacent property.

COMPLETED ELIMINATIONS.

Since 1924, fourteen grade crossing eliminations on state highways have either been completed or are now under construction as follows:

POLARIS, Nevada County—Crossing of two main line tracks of the Southern Pacific Company and Truckee River was effected with one structure, an arch spanning the river, the tracks passing under the girder approach span. Proctor and Cleghorn, contractors; cost $53,000; completed October, 1925.

NORTH SACRAMENTO, Sacramento County—Subways under the tracks of the Western Pacific and Sacramento Northern railways made possible the removal of a dilapidated wooden trestle which crossed the railroad lines at grade. Lord and Bishop, contractors; cost $59,000; completed January, 1926.

WEST SACRAMENTO, Yolo County—Subway constructed under Sacramento Northern tracks to replace inadequate timber structure on poor alignment. Lord and Bishop, contractors; cost $22,000; completed March, 1926.

VENTURA, Ventura County—New underpass at same location to replace inadequate subway with center pier, which was removed and sight distance in either direction greatly

improved. Further improvement of alignment in highway is proposed. Construction by Southern Pacific forces; cost $16,000.

MONTEBELLO, Los Angeles County—Largest subway on state highway system, located south of Montebello on Los Angeles-Whittier highway, one of the heaviest traveled state highways. Original narrow highway, crossing tracks of Los Angeles and Salt Lake Railway (Union Pacific system) at grade, has been widened to 56 feet and a modern structure built to eliminate the grade crossing. The subway has two one-way openings, each with 28 feet clear width, dividing traffic into three lines each way. Subway was built by the railroad company, the highway commission cooperating at a cost of $200,000. Completed March, 1926.

ORO GRANDE, San Bernardino County—Subway constructed by Santa Fe railroad at cost of approximately $40,000. This elimination was made in conjunction with the realignment of both the state highway and the railroad between San Bernardino and Barstow; a very decided improvement.

ENCINITAS-CARDIFF, San Diego County—Two dangerous crossings of the Santa Fe Railroad were eliminated at these points in cooperation with the railroad by the relocation of a mile of highway under the direction of Division VII.

GRADE SEPARATIONS UNDER CONSTRUCTION.

HINTON, Nevada County—Overhead structure on the Truckee River highway crossing three tracks of Southern Pacific Company. T. H. and M. C. Polk, contractors; estimated cost $30,000.

PISMO, San Luis Obispo County—Overhead structure of reinforced concrete girder type over tracks of Southern Pacific; J. L. Webster, contractor; estimated cost $60,000. Part of important realignment project.

OCEANSIDE, San Diego County—Subway on Coast route under construction by the forces of Santa Fe Railroad; to be completed during the summer; estimated cost $50,000. Construction involves relocation of about a mile of highway which will materially improve alignment where traffic is heavy.

LAS FLORES, San Diego County—This project involves shifting of present subway and putting it on greater skew to provide wider opening and better alignment for highway. Grading of approaches now under way and construction of new subway will be started in near future by Santa Fe Railroad forces. Present narrow opening and sharp approach curves will be eliminated.

CARLSBAD, San Diego County—Reinforced concrete overhead structure to make possible realignment of Coast highway, and to relieve through traffic of the necessity of crossing the tracks of the Santa Fe and passing through business district of Town of Carlsbad. Most of through traffic will be taken away from present dangerous crossing; right angle turns will be eliminated from highway. Coon Brothers, contractors; estimated cost $35,000.

PROPOSED ELIMINATIONS.

The following eliminations have been proposed:

BEN ALI, Sacramento County—Subway to be built under double track main line of Southern Pacific north of city of Sacramento. A dangerous crossing where numerous fatal accidents have occurred will be eliminated. Application for order made to Railroad Commission.

SOUTH SAN FRANCISSCO, San Mateo County—Proposed subway on Bay Shore highway at South San Francisco under five tracks of Southern Pacific Railroad and one track of South San Francisco Belt Railway. Construction will be difficult because subway will be 1200 feet long and partly below tide level. Waterproofing will be necessary. Order dividing cost already has been made by the Railroad Commission. Plans are being prepared.

BRANAGAN, Orange County—Permanent subway will replace existing timber trestle under tracks of Southern Pacific branch line near Newport Beach on the new Coast highway. Authorized for construction during 1926.

SERRA, Orange County—Two subways are necessary at this point to effect connection between new Coast highway and existing Los Angeles-San Diego highway, one leading to Los Angeles and other to San Diego. The Santa Fe Railroad will elevate several miles of track to facilitate building of subways and will have charge of construction under cooperative agreement with commission. Estimate cost $115,000; work authorized for 1926.

DEL MAR, San Diego County—Application filed with Railroad Commission for order authorizing construction of reinforced concrete structure over Santa Fe Railroad, as part of plan for relocation of state highway through town of Del Mar. Present dangerous crossing at grade will be eliminated. Project authorized for 1926.

MOSSDALE, San Joaquin County—Subway under Southern Pacific Railroad on new alignment to replace present narrow and dangerous passage through pile trestle. This subway is necessary to complete approach to new Mossdale bridge over San Joaquin River. Proposed for construction during 1926.

Construction of grade separations by railroad forces does not mean that the work is being done solely at the expense of the railroads. It means, merely, that a cooperative agreement has been reached for the work to be done by construction forces of the lines. The Railroad Commission, as a general rule, assesses at least 50 per cent of the cost of all grade separations to the public.

The ultimate solution of all grade crossing problems is their elimination. The work necessarily will be going on for many years and will entail an expenditure of millions of dollars before all dangerous crossings have been removed from California state highways.

DOWELL BILL PASSES HOUSE

THE ACTION of the House of Representatives in passing the Dowell Bill (H. R. 9504) on April 16th without a single dissenting vote is cheering news for supporters of federal aid throughout the country. It is evidence that congress has become convinced that the nation as a whole favors this legislation and a continuation of the present policy of state and national cooperation in the construction of interstate highways.

The bill authorizes appropriations of $75,000,000 a year for the fiscal years 1928 and 1929 for aid to the states, and $7,500,000 a year for each of the two years for construction of roads in the national forests. This latter provisions is of special importance to western public land states.

The measure now goes to the Senate where it will come before the committee on Post Offices and Post Roads. The membership of this committee is as follows:

George H. Moses, New Hampshire, Chairman; Lawrence C. Phipps, Colorado; Tasker L. Oddie, Nevada; Robert N. Stanfield, Oregon; Porter H. Dale, Vermont; Jesse H. Metcalf, Rhode Island; Coleman Dupont, Delaware; Thomas D. Schall, Minnesota; W. H. McMaster, South Dakota; Lynn J. Frazier, North Dakota; Kenneth McKeller, Tennessee; J. Thomas Heflin, Alabama; Park Trammell, Florida; Woodbridge N. Ferris, Michigan; Cole L. Blease, South Carolina; Sam G. Bratton, New Mexico.

George H. Henry, 241 Senate Office Building, Washington, D. C., is secretary of the committee.

STATE GETS ON JOB PROMPTLY

(From the Marysville Appeal.)

The prompt action of the California Highway Commissioner in putting a crew of men with necessary machinery to work on the Browns Valley grade to keep up this section of road in the best possible condition will be highly appreciated by all travelers, but it will be especially gratifying to those who will have their fruit to market this summer.

Within twenty-four hours after accepting the cooperation offers of the supervisors the state had its employees on the job and the work will be rushed to early completion. The road will be graded, widened and covered with a heavy coat of crushed rock and then oil will be applied and should prove a mighty satisfactory improvement over the present deplorable condition of this important artery of travel to this city.

SELECTION OF ROCK AND GRAVEL FOR HIGHWAY CONSTRUCTION*

By C. L. McKesson, Materials and Research Engineer.

IN HIGHWAY construction work approximately half of the material, measured by volume, consists of rock and gravel. The safety and durability of structures, pavements, and of cheaper metalled surfacing is, in varying degrees, dependent upon the quality of the stone and gravel used in the work.

C. L. McKesson.

Most of the tests heretofore developed and in general use at the present time were devised in the days when macadam surfacing was the highest type of pavement and when structures were generally of masonry. Quarrying methods and equipment have greatly changed, and some of the tests which could easily be applied to material quarried by hand and produced in small quantities are not practicable for testing of material produced in modern quarries, where many thousands of tons are produced by a single blast. Hand quarrying permitted of elimination of waste, soft materials in seams and of the selection of materials of uniform quality. In modern quarry practice such refinements are not usually feasible and the product must be accepted or rejected upon average samples and not upon small hand-picked samples. Some of the tests were considered of special value in anticipating wear of macadam under slow moving, iron-tired vehicles, but now, instead of such traffic, we have fast moving, heavily loaded, rubber-tired vehicles.

Impact Now Important.

Impact is now one of the most important considerations in the design of pavement or structures. Toughness in rock is the property which enables it to resist impact while hardness has to do more with resistance to abrasion, yet it is safe to venture that 90 per cent of the rock is tested for abrasion only and the material accepted or rejected on this property alone. It is well known and will be demonstrated hereinafter that rock, often extremely hard, is yet quite brittle and, therefore, unsuited for many uses in highway construction.

In the work of the California Highway Commission we have endeavored to develop tests which will indicate the important properties of rock and gravel, with the realization that such tests should be applicable to average samples of material as commercially produced. We have endeavored, as far as possible, to make the tests parallel the results of actual service conditions. In many cases samples were secured of rock products which have actually given unusually good service in highway work. These samples were tested and the results were used in arriving at tentative standard requirements. Unsatisfactory materials have been similarly tested and studied. In this work we have had valuable cooperation from the division engineers and their assistants.

New Testing Methods Developed.

Our tests are, in part, a modification of the older and well-known tests, and, in part, a development of our own laboratory. The standard test will, in each case, be described together with the modified test or new test used by us. The testing practices described are not given out with the idea that they are to be adopted as standard tests in their present form, but in order that others interested in the improvement of testing practices may have the benefit of our work in this direction. The tests will be taken up for discussion in what we believe to be the order of importance.

1. Toughness.
2. Cementing value.
3. Hardness.
4. Wear when saturated.
5. Absorption.
6. Voids.

TOUGHNESS TESTS.

A. S. T. M. Standard Method and Jackson Test.

The toughness test which has been considered standard practice in the past, and described in U. S. D. A. Bulletin No. 1216, was made in the following manner:

Quarry samples were taken, measuring at least 6" on a side and 4" in thickness. It was specified that the plane of structural weakness should be marked on the specimen; that the sample should be freshly quarried material and free from incipient fractures or flaws. Preferably the samples were taken by splitting from large pieces by the use of plugs and feathers. The prepared specimens consisted of cores about 1" in diameter and 1" in length which were drilled from the larger samples perpendicular and parallel to the plane of structural weakness of the rock. These cores were drilled with a diamond drill and the ends sawed with a diamond saw.

The specimens were tested by placing them on an anvil in a Page impact machine and subjected to blows from a hammer weighing about 2½ pounds. The fall of the hammer was carefully measured and the height of the fall in centimeters at failure was taken as the toughness of the specimen.

Not Suitable for Commercial Output.

The foregoing test, while well adapted to scientific research work, did not lend itself to the testing of commercial quarry output. It will be noted that the specimen required was a large piece of carefully selected rock. In the larger quarries there is usually a lack of uniformity in the quarry face and this toughness test would be accurate only for the particular quality of rock selected for the test. In order to determine the average toughness of the commercial product, it would have been necessary in some quarries to have taken many samples representing the softer rock in the quarry face and the harder grades of rock. After determining the toughness of each, some average might have been worked out which would have been indicative of the toughness of the commercial product.

The fact that the samples had to be so carefully prepared and required a diamond drill and other expensive mechanism, has prevented the test from coming into general use in the smaller laboratories. The test, as originally outlined, was entirely inapplicable to gravels, and a similar test was worked out by Mr. F. H. Jackson and published in the Proceedings of the American Society of Testing Materials in 1922 in which fifty pieces of gravel were selected varying from ¾" to 2" in diameter and these specimens were subjected to the blow of a hammer. This test at least had the merit of being applicable to field samples, but it left some things to be desired.

It will be noted that the toughness tests are really impact tests in which the toughness of the stone is expressed in terms of its ability to resist destruction under the impact of a hammer blow.

L. A. Rattler Test.

During 1916 and 1917, the writer, with Mr. B. W. Matteson, was engaged in a revision of specifications for the City Engineer's Department of Los Angeles, and at that time the inadequacy or unsuitableness of the standard test for toughness was given consideration. The standard toughness test above described was not applicable to local conditions because of the extreme lack of uniformity of the rock in some of the larger quarries and because it could not be used for testing gravels.

*Presented at the State Convention of County Engineers at San Diego, California, March 12, 1926.

Research work at that time demonstrated that the Deval rattler test did not insure a uniformly good quality of rock for all construction purposes. In tests of specially prepared samples, it was found that adulterations of sound andesite rock with as much as 15 or 20 per cent of soft weathered stone dod not greatly lower the percentage of loss in the Deval. Such a high percentage of soft material was believed to be objectionable and a large number of concrete tests were made in the study of the effect of quality of stone upon strength of concrete. In these tests it was found that appreciable quantities of the softer stone did affect the strength of concrete in the richer mixtures. Up to about 3000-pound concrete the quality of the rock apparently had little effect on concrete strength, but in concrete running from 3000 pounds to 6000 pounds per square inch, compressive strength, the quality of rock was of increasing importance.

New Impact Test Developed.

A new test was devised in an effort to secure an impact test which would give a relative measure of the toughness of rock and which could be applied to typical samples of commercial products. Mr. T. A. Fitch, Testing Engineer of the city of Los Angeles, cooperated with Mr. Matteson and the writer in the experimental work which lead to the adoption of this rattler test which was adopted by the city of Los Angeles as the Los Angeles rattler test. It is believed that this test has not been described heretofore except in standard specifications in use in southern California. The Los Angeles rattler test is very closely related to the test now regularly used by the California Highway Commission. It will be described in some detail in order that the principles involved in impact tests of this sort may be clearly understood.

The rattler used in the Los Angeles rattler test consisted of a drum 28″ in diameter and 20″ in length, longitudinally mounted on a horizontal shaft and having a shelf 4″ wide extending from end to end on the inside. The shell of the rattler drum consists of sheet steel ½″ in thickness. The drum is revolved during the test at a rate of between 28 and 30 revolutions a minute. The sample for the rattler test consists of 11 pounds (5 kilograms) of crushed rock or gravel, all of which passes a 2″ screen, 60 per cent of which is retained on ¾″ screen and all retained on ½″ screen. The sample is placed in the drum with a charge consisting of fourteen cubical blocks of cast iron having rounded corners and edges, the blocks having a total weight of 11 pounds.

After charging with the sample and the iron cubes, the drum is revolved 500 revolutions. With each revolution, the rock sample and iron cubes are picked up on the shelf and carried upward until discharged across the drum by the inclination of the shelf. The shot and rock falling together produce impact quite similar to that produced by hammer blows. The loss is considered that portion of the sample which, after the test, will pass a 10-mesh screen.

There is doubtless some slight loss in this test due to abrasion or the wear of the rock particles upon themselves and upon the iron cubes. This proportionate part of the loss is, however, very low due to the fact that the total time of operation is only about 17 minutes, 1/20 of the time required for the Deval abrasion test. Rock and gravel, lacking in toughness, will show very high losses in the Los Angeles rattler test, although the hardness may be excellent. Experimental work shows clearly that this test measures the toughness rather than hardness or resistance to abrasion. Any appreciable percentage of soft stone mixed with a harder rock proportionately affects the loss in this test. Although the test is of short duration, it is very severe and the losses are much higher than in the Deval rattler, the toughest rock encountered showing a wear in this test of about 7 per cent and some of the brittle granites and granitic gravel showed losses as high as 50 to 60 per cent.

In a study of the comparative results of the Los Angeles rattler and the Deval abrasion tests, identical samples were prepared and run in both rattlers. The samples complied with the standard practices for the Deval except that they were graded samples, 60 per cent passing the 1½″ and retained on the ¾″ and 40 per cent passing the ¾″ and retained on the ½″. In Figure No. 1 the results are shown of these special Deval tests and of tests with the Los Angeles rattler and from these comparative results it is quite clear that the impact rattler measures toughness and not resistance to abrasion.

Abrasion Test for Gravel.

This test, originally described in Bulletin No. 555 and later in a revised form in Bulletin No. 1216, U. S. Department of Agriculture, is, in reality, a modified impact test rather than an abrasion test as is indicated by the name. The charge in this case consists of 11 pounds of graded material passing 2″ and 25 per cent retained respectively on the 1½″, 1″, ¾″ and ½″ screens. The wear test is made in the standard Deval rattler with a charge of shot consisting of six cast-iron spheres weighing approximately 1 pound each. As the Deval drum has an inclined axis, the charge of shot and sample is thrown alternately from end to end in the revolving cylinder and the heavy shot produces impact. The test is continued for 10,000 revolutions as in the Deval test and there is undoubtedly some loss due to abrasion.

That the greater percentage of the loss is due to impact rather than abrasion has been well demonstrated in our laboratory by comparison of Deval tests and shot rattler tests on identical samples. This test is used as a standard test for toughness and abrasion of gravels by the California Highway Commission. Occasionally when it is desired to determine toughness independently of abrasion, samples are also run in the Los Angeles rattler described above.

Impact Rattler Test for Rock.

This test, now being used as a standard in the laboratory of the California Highway Commission, is identical with the foregoing test for gravel, except that the charge consists of crushed rock. During the last two years, hundreds of tests have been made on samples from all sections of the state. Whenever possible, tests have been made on the same sample with the standard Deval as well as this impact test. Experience has demonstrated very conclusively that this shot rattler test is indicative of toughness. The losses in this test are much less than those in the Los Angeles rattler test, although the time of operation is 20 times greater.

There is no fixed relation between the losses in impact tests, either shot rattler or Los Angeles rattler, and the losses in the standard Deval. The hard brittle rocks show low losses in the Deval but high losses in the impact. Hard and tough rocks show low losses in all of these tests. Typical comparisons are shown in Table No. 1 in which the results of this test are compared with those obtained with the standard Deval. The test is readily applicable to field samples in that it may be made on graded material. It is usually the practice to secure 50 to 200 pounds of the material from the work. This is quartered down to the 11 pounds required for the test, and the test is, therefore, made on a sample which is typical of the commercial product. No special apparatus is required as is the case with the A. S. T. M. standard toughness test described above.

In many cases it is necessary to test material which contains crushed particles and rounded water-worn material. In such cases, after the sample is quartered down, the rounded particles are counted and this is taken into consideration in connection with the percentage of wear in determining the suitability of the material. The sharp angular particles in crushed rock show a some-

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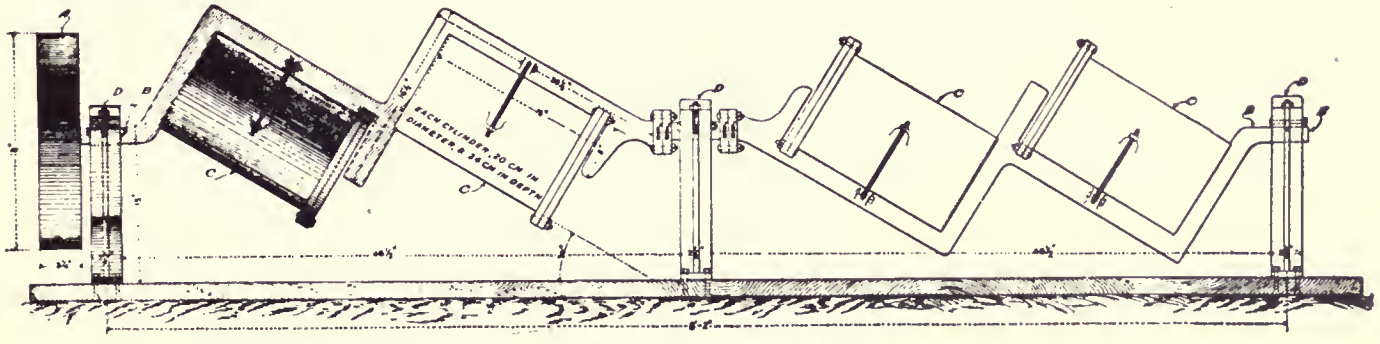

Abrasion machine—Deval type (front view).

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(Continued from Page 7.)

what higher loss due to abrasive action in the test. The losses from impact are probably more or less the same in both tests.

Figure No. 2 shows a comparison of results of tests on identical samples made with the shot rattler and with the Los Angeles rattler. The material consisted of crushed rock in each case. This graph indicates that there is a relation between losses in both tests although the relation is not a constant one. With the crushed rock samples, the shot rattler test gives about 60 per cent of the loss obtained with the Los Angeles rattler. On rounded gravel, the losses are about one-half those obtained in the Los Angeles rattler.

CEMENTING VALUE TESTS.

Standard Test.

The standard test for determining the binding power or cement value of rock described in Bulletin No. 370, U. S. D. A., consisted of grinding 500 grams (1.1 pound) of the material in a ball mill until it reached a consistency of stiff dough. The sample was then moulded under pressure into cylindrical briquettes 1" in diameter and 1" in length. After thoroughly drying, these cylinders were broken by allowing a 2.2-pound hammer to strike them with a drop of .4". The number of blows required to produce failure was called the cementing value of the rock.

California Cement Value Test.

The standard test above described, being made on a flour produced by grinding the rock, did not take into consideration the shape of the finer rock particles in the crusher product and the tendency of such particles to bind in the roadway by interlocking. We have, therefore, developed a test which we believe to be somewhat more practical in that it measures the cementing value of the material which will be actually used. In our test, the material passing ½" circular opening is removed from the sample received from the field. Screen analysis is made of the material, and if it is found to contain less than 15 per cent passing the 100-mesh sieve, enough material is pulverized to supply the deficiency and to bring the fines up to this requirement.

It was found in earlier experiments that material containing less than 15 per cent of fines passing the 100-mesh did not show satisfactory binding properties and that it was necessary to maintain the fines at a constant figure to secure uniform results. The ½" material thus selected is ordinarily typical of the finer material which will be sent to the work from the quarry or gravel pit. It represents what might be considered the mortar or matrix in the crushed rock surfacing.

How Sample is Tested.

The sample, prepared as above, is moistened and mixed as in the preparation of a concrete sample. The amount of water used varies with the character of the material, but an effort is made to approach the condition known in soil tests as moisture equivalent saturation. The same consistency in concrete would be defined as "stiff." With ordinary crushed rock surfacing material, the amount of water usually runs from 10 to 12 per cent. The material, after wetting, is tamped into a 4½" cubical mould and is placed in a warm oven at a temperature of about 100° F. until it has dried sufficiently to permit of its removal from the mould. Drying is then continued until the specimen ceases to give off moisture, after which it is capped with plaster of paris and tested for compression in a Universal testing machine.

The cementing value is taken as the average compressive strength per square inch of three specimens. There is a wide variation in results obtained with different materials, but fairly uniform results can be obtained in repeated tests of the same material. The strength developed ranges from 0 to about 225 pounds per square inch. One hundred to 150 pound strengths are not unusual. Figure No. 3 shows cementing test specimens ready for testing machine.

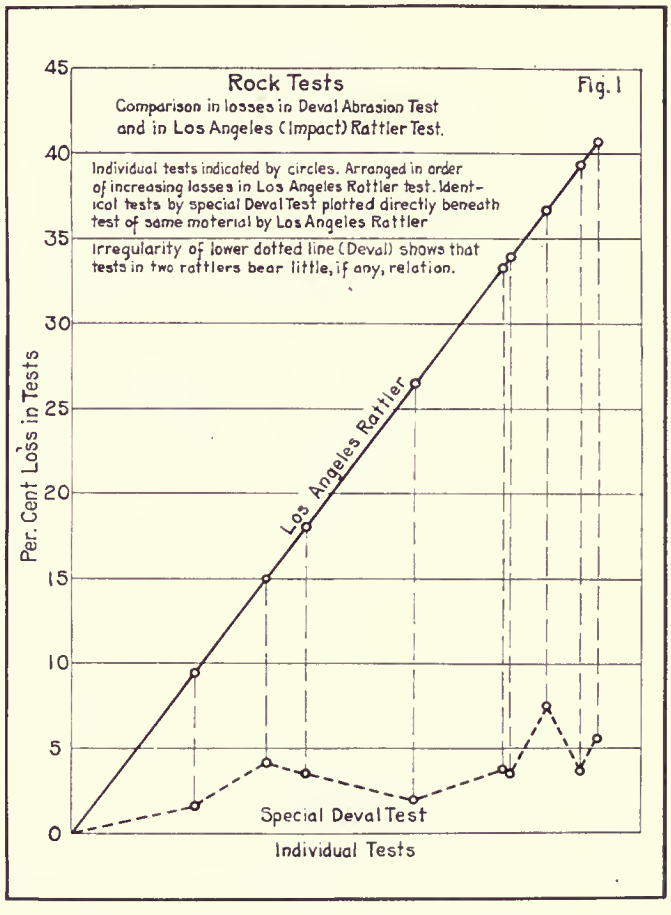
HARDNESS TESTS.

Dorry Hardness Test.

This test has been recognized as a standard for many years, but is seldom made outside of the very large laboratories due to the special equipment required. The test consists of drilling a 1" core with a diamond drill and of grinding it on a disc in a Dorry Hardness Machine, using sand as an abrasive agent. The test is, from a practical standpoint, open to all of the objections pointed out in the standard toughness test.

Deval Abrasion Test.

This test, which has been standard practice for a number of years throughout the country, is essentially a hardness test in that the abrasive losses are produced by the particles rubbing together in the cylinder of the testing machine. In this test, fifty pieces are usually cut by hand with a stone hammer and are about 2" in size. The sample is placed in a cylinder which is inclined at an angle of 30° to the horizontal shaft by which it is rotated. The cylinder is closed with a cap and rotated 10,000 revolutions at the rate of about thirty revolutions per minute. The pieces of rock slide from end to end as the cylinder revolves. The portion of the sample which, after the test, passes a 16-mesh sieve is considered the loss.


Rock Tests
Fig. 1
Comparison in losses in Deval Abrasion Test and in Los Angeles (Impact) Rattler Test.
Individual tests indicated by circles. Arranged in order of increasing losses in Los Angeles Rattler test. Identical tests by special Deval Test plotted directly beneath test of same material by Los Angeles Rattler
Irregularity of lower dotted line (Deval) shows that tests in two rattlers bear little, if any, relation.
Per. Cent Loss in Tests
45
40
35
30
25
20
15
10
5
0
Los Angeles Rattler
Special Deval Test
Individual Tests

With ordinary quarry rock of a reasonable degree of hardness, the losses vary within very narrow limits. It has been more or less standard practice to consider any material showing less than 4 per cent wear as satisfactory in this test. The usual variation is from 2 to 5 or 6 per cent, and in order to emphasize the small differences, the originators of this test devised the "French coefficient," which is the quotient obtained by dividing 40 by the loss in per cent. A sample showing 2 per cent loss has a French coefficient of 20, while a sample showing 4 per cent loss has a French coefficient of 10.

In discussing this test, engineers sometimes describe it as an impact and abrasion test and there are possibly some slight losses due to the impact of the particles sliding back and forth in the cylinder. The losses due to this cause are probably extremely low and the test can not be considered as any measure of the toughness of the rock.

In Table No. 1 it will be noted that many samples which show a low loss in the Deval, show very high losses in the shot rattler which is much more nearly an impact test. The Deval rattler test is still a useful test for determining hardness of rock, but we believe that it should be used in conjunction with the shot rattler or Los Angeles rattler which determine the relative toughness. The artificial term "French coefficient" has little value and has been dropped by many of the leading testing laboratories, the loss being expressed simply as the loss in per cent.

WET TESTS.

Sodium Sulphate Test.

This standard test is made by immersing ten small pieces weighing about 2 pounds in a saturated solution of sodium sulphate. The immersion is continued for twenty hours, the sample dried for four hours and then immersion repeated. This treatment is carried on for five successive periods, twenty-four hours each. Samples which exhibit marked checking, cracking or disintegrating are considered to have failed in this test. This test has value in determining the likelihood of the rock breaking up due to frost action or disintegration in continued wet weather.

Wet Wear Test.

In the laboratory of the California Highway Commission, we have experimented considerably with the wet wear test in which the sample is subjected to the standard Deval or shot rattler test as above described except that sufficient water to cover the sample is added when the specimen is placed in the cylinder. It has been found that materials which show excessive wear or tendency to slack will show much higher losses in this wet test than they show in the same test made dry. Some materials which are unaffected by water, show slightly less losses in the wet test due probably to the cushioning action of the water in the test cylinder.

MISCELLANEOUS TESTS.

Rock and gravel samples are tested for absorption and specific gravity by the standard methods. These characteristics are of more or less importance in identifying materials and in that they give some general index to the character of the rock. The specific gravity test is necessary in order to determine the voids in crushed stone or gravel as received on the work. Void determinations are made on concrete aggregate by measuring one cubic foot or a fraction thereof of loose material and then by weighing the material so measured. The voids are determined from the ratio of the material weighed to the weight of one cubic foot absolute volume of the same material.

INTERPRETATION AND APPLICATION OF TESTS.

In General.

There are no fixed and set standards by which any rock or rock product can be said to be good or bad. In every case the material must be studied with reference to the specific use for which it is intended and its suitability determined by comparing the tests which are more or less comparable to the service requirements. The interpretation of tests will be discussed in connection with some of the more important types of construction in which rock products are used.

Cement Concrete.

In cement concrete, the stone is surrounded by Portland cement mortar and there is no abrasive action between the rock particles. Extreme wearing conditions might in time expose the rock in the surface of the pavement to direct wear, but the wear tests which have been made do not indicate that the wear of the concrete would necessarily be in proportion to the abrasive losses of rock in the Deval test. Some of the softer rocks have made excellent showings in the wear tests of concrete. Concrete in pavement and in structures is subjected to tensile and compressive stresses and it has been found by laboratory experiments, that the better quality of aggregate is reflected by increased strength in concrete.

The effect on concrete strengths is quite appreciable when the mortar strength is high. Weak mortars do not develop the strength of the coarse aggregate. In concrete of 3000 pounds, or more, compressive strength, the quality of the coarse aggregate is an important consideration. The Deval rattler and shot rattler tests indicate relative hardness and toughness of the material and are, therefore, applicable in securing a good quality of rock for use as coarse aggregate. For aggregate used in high strength concrete, the loss by the Deval test should probably not exceed 5 per cent, and the loss by the shot rattler test should probably not exceed 25 per cent on crushed rock.

The shot rattler loss should not exceed 18 or 20 per cent on screened gravel. Coarse aggregate for concrete work should not show excessive gain in the absorption test, particularly where the concrete is to be water-tight for the protection of steel or resistance of alkalies. Rock which weathers rapidly and which shows excessively high losses in the wet test would not be desirable for use in unprotected concrete.

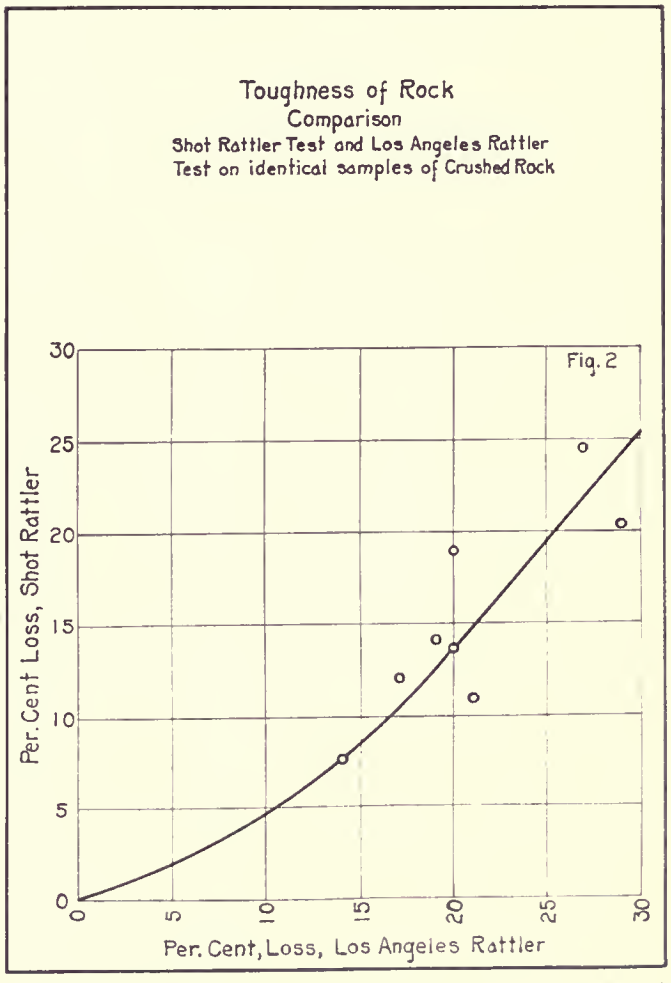
Asphaltic Concrete and Bituminous Macadam.

In this type of work, the coarse aggregate is embedded in a plastic mortar consisting of sand and asphalt. The rock is not protected from impact, but is largely protected from abrasive losses. It is very obvious, in the light of the preceding discussion, that a material which will resist repeated blows from the wheels of traveling vehicles, will be one which will show similar resistance to destruction in any of the impact tests described. In other words, toughness is essential in rock which is to be used in bituminous work. The writer has had the occasion to investigate bituminous pavements in which brittle coarse aggregate had been used, and found a very large number of shattered pieces of stone and of fractured surfaces which had been produced in rolling and under traffic. This destruction of coarse aggregate and the production of uncoated fractured areas is to be avoided in bituminous work. The Deval rattler test gives little or no indication as to the suitability of rock for bituminous work.

In Table No. 1 attached, will be found samples showing a loss of less than 2 per cent in the Deval with a loss of more than 20 per cent in the shot rattler. Such material is hard and brittle and may be expected to break up under the roller and under traffic in bituminous pavement.

Should Consider Materials.

In this type of work, as in all others, the character of materials available should be considered in fixing the limits of loss in any rattler test. The writer states as his opinion based on experience and observation, that the limit of loss in shot rattler test for rock to be used in bituminous work should not exceed 15 per cent. With this limit on shot rattler, the loss in the Deval rattler test might reasonably be fixed at 4 per cent. These values, of course, apply to crushed rock or crushed gravel and not to screened gravel.



The desirability of using screened gravel in bituminous work is a matter which will not be gone into in this discussion. In much of the bituminous macadam construction, the bituminous wearing surface is placed on a water-bound macadam base. In such cases, the base rock should conform with requirements for macadam and crushed stone surfacing.

Macadam or Crushed Rock Surfacing.

In this type of construction the rock is exposed directly to weathering action. In countries where the macadam type of con-

(Continued on next page.)

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(Continued from page 9.)

struction prevails, much study has been given to the wearing qualities of surfacing rock. In some sections of Europe, the road authorities are able to forecast quite accurately the tonnage of road metal per year required for the maintenance for any given section of road. They are familiar, from long service tests, with the wearing properties of their road metal, which is usually taken from quarries which have been in operation for many years.

In this country we are continuously opening up new sections of highway and experience in the locality does not give data from which to judge the wearing properties of the local materials. In this state, we have a constantly increasing mileage of crushed stone surfacing, some of it under very heavy traffic. There can be no question but that the cost of maintenance of such a road will vary greatly with different surfacing materials. In such cases we are forced to rely on laboratory tests in an effort to pass on the relative suitability of materials which are locally available. Crushed rock is heavy and transportation charges high. It is usually desirable to develop local materials instead of shipping from remote commercial supplies.

It was the idea of securing practical, easily interpreted tests that has lead to considerable research work in our laboratory, during the last two years. The tests which have been described above are believed to give a good index to the probable value as surfacing material of any type of crushed stone or gravel. Separate tests, somewhat similar in nature, are being developed for disintegrated granite and the lower types of metal surfacing. These will be omitted from this discussion.

As availability of material and the character of local deposits are of paramount importance in crushed rock surfacing, no attempt will be made to set forth exact test limits. Desirable material should show a cementing value of more than 30 pounds. Material which shows 100 to 200 pounds cementing value may be expected to give a well cemented surface which will be easily maintained and not excessively dusty under normal conditions. The lower the loss in the shot rattler test, the better the material for surfacing as long as it shows reasonable cementing qualities, and usually good cementing quality is found associated with toughness, while low cementing value is frequently found in a rock which shows a low loss in the Deval and high loss in the shot rattler.

Local Samples Tested.

The comments in Table No. 1 under the column of remarks, will indicate, in a measure, the manner in which the test results are interpreted in the laboratory of the California Highway Commission. It is our usual practice to secure samples of the various materials locally available and to test each for Deval, wet and dry shot rattlers, and cementing value. The results from the various local materials are compared and the ones which show good cementing values, and the lowest loss in the shot rattler, are recommended for use.

In macadam work and in crushed stone surfacing, no material should be considered as first-class which shows a loss in the shot rattler in excess of 15 per cent. Materials up to 20 per cent are

TABLE 1—RECENT ROCK TESTS.

The Testing and Research Laboratory of the California Highway Commission.

Sample No	Material	From	County	Deval		L. A. Rattler, per cent loss	Absorption	Per cent loss Shot Rattler		Per cent crushed in Shot Rattler	Sp. Gr.	Cementing test (Cal.)	Remarks
				Per cent loss	F. C.			Dry	Wet				
2001	Gravel	San Dimas	Los Angeles				0.8	24.9	36.0	13	2.61		Unsuitable for use in concrete.
2002-5	Cr. Rock	Veronica	Santa Barbara	4.9	8.2		1.8	22.4	35.0	100	2.52		Might be used in concrete or macadam base.
2006	Gravel	Yosemite	Merced				0.7	28.0	29.5	33	2.64		Not satisfactory for use in asphaltic concrete.
2007	Shldr. Rock	Orestimba Creek	Merced				0.9	13.1		64	2.65	84	Satisfactory for rock shoulders.
2008-11	Cr. Rock	Honda	Santa Barbara				0.5	15.9		100	2.44		
1686	Cr. Gravel	Livermore	Alameda	4.1	9.7	19	0.9	14.2		100	2.64		Satisfactory for any purpose.
1684	Cr. Rock	Logan	Santa Cruz	4.1	9.7	20	0.7	20.6		100	2.97		Satisfactory for concrete.
1681	Cr. Rock	Logan	Santa Cruz	3.6	9.2	21	0.6	11.0		100	2.93		Satisfactory for any purpose.
1674	Cr. Rock	Stege	Contra Costa	7.9	5.06	27	1.3	24.6		100	2.93		Unsatisfactory.
1678	Cr. Rock	Stege	Contra Costa	3.3	12.1	17	0.6	12.1					Satisfactory for any purpose.
2023	Gravel	Yosemite	Merced				0.8	24.9		19	2.67		Lacking in toughness.
2026	Crushed Rk.	Convict Camp	Del Norte	1.5	26.7		0.2	3.8		100	2.88	207	Very satisfactory for any purpose.
2027	Crushed Rk.	Convict Camp	Del Norte	1.6	25.0		0.3	8.4		100	2.89	194	Very satisfactory for any purpose.
2028	Crushed Rk.	Convict Camp	Del Norte	1.5	26.7			5.3		100		116	Very satisfactory for any purpose.
2031-42	Crushed Rk.	Tomasson	Solano				1.4	7.2		100	2.65	197	Very satisfactory for any purpose.
2045	Cr. Boulders	Cascade Plant	Yosemite	3.8	10.5		0.8	30.4		100	2.68		Lacking in toughness.
2051-84	Surf. Rock	State Hwy. Quarry	Mendocino				1.5	17.7	42.0	100	2.76	112	Satisfactory for maintenance of rock surfacing.
2052	Cr. Rock	Columbia	Tuolumne	3.2	12.5		0.3	25.9		100	2.82		Abrasion O.K but toughness low.
2057	Cr. Rock	State Hwy. Quarry	Mendocino	7.2	5.6		2.3	14.8		100	2.75	108	Satisfactory for rock surface maintenance.
2060	Gravel	Near Blythe	Riverside				1.2	26.7		93	2.62	78	Satisfactory for rock surface maintenance.
2061	Gravel	SW. of Black Butte	Riverside				1.0	17.0		70	2.58	182	Very satisfactory for rock surface maintenance.
2067	Gravel	Oakdale	Stanislaus	1.4	28.6		0.3	20.0		100	2.70		Satisfactory for use in concrete.
2072	Cr. Rock	Novato	Mendocino	2.1	19.0		0.2	12.6	9.6	100	2.67	105	Satisfactory for all purposes.
2079	Cr. Rock	Clearinghouse	Mariposa	2.4	16.6		0.5	13.6	21.7	100	2.71	39	Satisfactory for all purposes.
2080	Cr. Rock	N. Crescent City	Del Norte	2.8	14.3		1.3	10.1		100	2.68	105	Satisfactory for all purposes.
2095	Cr. Rock	S. of Petaluma	Sonoma	2.9	13.8		1.5	11.5	20.6	100	2.78		Satisfactory as to wear. Had a chalky coating.
2098	Gravel	Green Valley	Sonoma				1.1	12.5	17.3	95	2.61		Satisfactory for concrete.
2103-5	Gravel	Butte Cr.	Butte	1.8	22.2		2.1	10.4	11.7	100	2.70	131	Satisfactory for all purposes.
2107	Cr. Rock	Wool Rock	Mendocino	4.6	8.7		1.2	15.8		100	2.58	97	Satisfactory for all purposes.
2108	Cr. Rock	Saratoga Springs	Lake	4.1	9.8		1.5	12.0		100	2.72	69	Satisfactory for all purposes.
2109	Cr. Rock	W. of Lakeport	Lake	6.6	6.1		1.5	13.0		100	2.84	104	Satisfactory for rock surfacing.
2111	Cr. Rock	Hopland Grade	Mendocino	7.1	5.6		0.8	15.6		100	2.62	119	Has given satisfactory service in rock surfacing.
2121	Cr. Rock	Rattle Snake Cr.	Mendocino	11.0	3.6		1.1	19.5		100	2.81	128	Has given satisfactory service in rock surfacing.
2124	Gravel	San Gorgonio	Riverside				0.7	18.5	23.6	55	2.73		May be used in concrete.
2125	Cr. Rock	Men.-1-A	Mendocino	8.7	4.6		1.0	16.0		100	2.79	93	Has given satisfactory results in rock surfacing.
2126	Cr. Rock	Men.-48-C	Mendocino	5.0	8.0		1.1	17.9		100	2.54	130	Satisfactory for rock surfacing.
2127	Cr. Rock	Men.-48-C	Mendocino	14.7	2.7		3.2	36.0		100	2.43	73	Would wear rapidly in surfacing. No. 2126 should be used.
2128	Cr. Rock	Sutter Butte	Sutter	9.4	4.3		8.3	44.2	54.0	100	2.10	93	Little wearing value. Good binder for harder rock.
2130	Cr. Rock	Santa Cruz	Santa Cruz	2.5	16.0		0.8	7.4	12.1	100	2.82		Satisfactory for concrete or asph. conc.
2142	Cr. Rock	Yuma, Ariz.		3.4	12.0		0.7	22.9	21.1	100	2.65		Somewhat brittle—good abrasive test.
2164	Cr. Rock	Lemoine	Shasta	3.2	12.5		2.2	20.8	45.9	100	2.64	116	Good dry weather rock surfacing.
2165	Cr. Rock	Truckee	Nevada	2.1	19.0		1.8	20.9		100	2.66	33	Low cementing value. Probably very dusty in rock surfacing.
2166	Cr. Rock	Alta	Placer	5.9	6.8		2.7	23.3	27.0	100	2.30	90	Will make good summer surfacing. Will wear rapidly.
2167	Cr. Rock	Rte. 1 Sec. C	Del Norte	2.3	17.4		1.2	6.6	12.1	100	2.78	177	An ideal rock for highway construction.
2183	Cr. Rock	Ventura River	Ventura	2.2	18.2		1.2	18.7	22.6	100	2 60	74	Satisfactory for all purposes.

perhaps entirely satisfactory for water-bound base when protected by an oiled top. For lighter traffic on crushed rock roads, material map be used which shows much higher losses in rattler tests provided the cementing value is good.

In comparing the usefulness of such material, it must be borne in mind that the softer material will wear away much more rapidly and will, therefore, require frequent replacing. It is quite possible that the loss from wear, other conditions being equal, might be in direct proportion to the loss shown in the shot rattler test. In such cases, analysis of the situation from an economic standpoint would sometimes indicate the desirability of shipping material instead of using that locally available but of lower quality.

The wet tests are of importance in considering the material for this type of work. These tests give an indication as to the increased wear which may be expected in wet weather and sometimes suggest that the material might be slippery when wet.

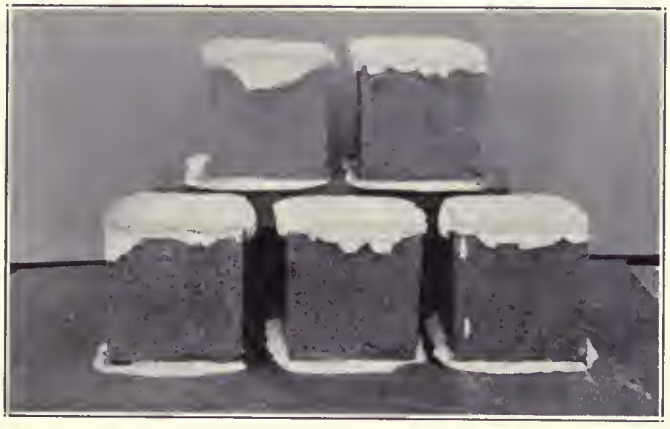

FIGURE 3—Cementing test speciments consist of 4½-inch cubes capped with plaster of paris. These specimens are ready for compression test.

CONCLUSION.

There are other tests which are of importance. In concrete, for example, it is very desirable, when the opportunity offers, to make up concrete with the same fine aggregate and cement, using the different coarse aggregate locally available. Compressive strength tests in these cases indicate in some measure the relative suitability of the coarse aggregates. Beam tests of concrete, similarily made, are also of value in indicating the effect of the different aggregates on flexural strength of the concrete.

Many millions of tons of crushed stone and screened gravel are used annually in road construction work. *If proper testing and inspection will result in any appreciable increase in service, the slight expense involved is certainly justifiable.* Fifty to a hundred dollars expended in rock tests may result in the selection of material which will give double the service of that which would otherwise have been used. Too frequently specifications use the general terms "hard, sound and durable" in a more or less meaningless way, and the selection of the stone to be used is left entirely to the contractor. He in turn chooses the source which is most economical from the production standpoint. The writer has seen cases in which the additional expenditure of 15 or 20 cents per cubic yard on material which was costing $3 per cubic yard, in place, would have resulted in at least a 100 per cent increase in the quality of the rock. Such practice is not good engineering or sound from an economical standpoint.

Due credit is given to Mr. F. T. Maddocks, Testing Engineer, for his active part in the development of rock testing as now practiced in the laboratory of the California Highway Commission and to Mr. C. S. Pope, Construction Engineer, who has made many suggestions which have been of value and assistance.

WORKMEN FIND SKELETON.

A maintenance crew employed by Division VI on widening work on the Sequoia Park Lateral near Three Rivers, Tulare County, recently unearthed a human skeleton, which was found in a sitting position and in a splendid state of preservation.

It is of small frame and has been pronounced by Dr. D. D. Nice, Sequoia Park physician, to be that of a woman, probably an Indian. There were some small pointed bones, not human, believed to be Indian hair ornaments, according to Dr. Nice, and a string of shell beads hung about the neck.

"PLEASURE TO PAY GASOLINE TAX"

So thinks Los Angeles man after drive over reconstructed highway along San Diego coast.

TAXPAYERS generally are not opposed to reasonable taxes when they have evidence that public funds are being expended economically and efficiently in the interest of the public good. This is true of taxes for state highways as well as other public enterprises. After a recent trip to San Diego over sections of reconstructed pavement, C. S. Phister, Los Angeles business man, wrote the Highway Commission declaring the work, when finished, will make the Coast highway the finest road in the land. When such results are obtained, it is a pleasure, Mr. Phister says, to pay the gasoline tax for highways.

His letter, which was wholly unsolicited, follows:

CHARLES S. PHISTER
WHOSESALE COAL
LOS ANGELES, CALIFORNIA
1228 S. Berendo Street

March 25, 1926.

California Highway Commission,
P. O. Box 1103,
Sacramento, California.

Gentlemen:

I have just returned from a trip to San Diego, and I want to compliment the commission on the good work it has done and is doing on the state highway from Santa Ana to the San Diego city limits.

When that work is finished it is going to be the finest piece of road in the world. Not only the plain cement road, but the grades, curves, and evcrything pertaining to the work is good and pleasant to drive over.

I also noticed the wire guards at dangerous curves, and other places needing protection. They are much better than the ordinary fence. I noticed in two or three places, where some of the wild drivers had run into them, that they do not break down like the board fence; wire mesh bends but holds.

The contractor working on the piece of road between San Juan Capistrano and Oceanside keeps the detour in good shape, making it more pleasant for the driver than is usual on detours. Where the driver is forced to go off the concrete, this contractor keeps the holes filled up smooth and even so there is very little roughness to go over. He is to be congratulated on his work.

If the city of San Diego can now only be induced to build new approaches to Torrey Pines, both on the north and south ends, the highway from Los Angeles to San Diego is going to be the finest in the land, and one that will be a pleasure to drive over.

With such a road as the result of your work, it is a pleasure to pay the gasoline tax.

Very truly yours,

(Signed) C. S. PHISTER.

1926 ESSAY CONTEST.

May 8th has been fixed as the closing date for the 1926 essay contest conducted by the Highway Education Board for the H. S. Firestone University Scholarship. The subject this year is: "The Relation of Improved Highways to Education." It is open to all students of high school grade throughout the United States and its territories.

MOUNTAINEERS TO BE GIVEN BATH.

"Please issue a purchase order for water to be used during the sprinkling season on the following parties:
Mr. F. ----------M.----------, Ione, Cal.
Mr. J. ----------H.----------, Pine Grove, Cal."
—Excerpt from recent field requisition received by Division X.

WHAT THE DIVISIONS ARE DOING

DIVISION I.

HEADQUARTERS, WILLITS.

T. A. BEDFORD, DIVISION ENGINEER.

Counties of Del Norte, Humboldt, Mendocino, and Lake.

THE 80-foot vertical lift span timber truss bridge over Eureka Slough, at the city limits of Eureka, became unsafe for traffic, when the lower chord of one truss parted, thrusting the end posts against the towers at each end. To permit light traffic, and be able to raise the span for boats to pass thereunder, it was necessary to make quick emergency repairs. The tides were harnessed to assist with the work.

A barge was floated under the truss on a rising tide, anchored in position and cribbing built up on the deck to the truss. A wedge

Scow floated in on tide supports Eureka Slough bridge, Division I, while repairs are being made.

was placed between the truss and the cribbing and as the tide raised the truss from its seat, the wedge was driven out to hold the truss at the correct elevation, while house jacks were used on the ends of the broken lower chord to force the ruptured member together at the break until splice plates were fitted in position.

The work was completed on the one tide and traffic up to five tons permitted to use the bridge immediately. Additional strengthening of the truss is being accomplished.

DIVISION III.

HEADQUARTERS, SACRAMENTO.

F. W. HASELWOOD, DIVISION ENGINEER.

Counties of Butte, Colusa, El Dorado, Glenn, Nevada, Placer, southern Plumas, Sierra, Sutter, Yuba, and northern Sacramento and Yolo.

COMPLETION of the grading through the famous Truckee canyon, one of the most spectacular projects ever attempted in Division III, is now nearing completion. Within two or three weeks after this Bulletin is off the press, the Nevada Contracting Company will have completed the work between Floriston and the Nevada line. Between Truckee and Floriston, the work already is finished.

Survey work on this major project was begun in March, 1923, on the 19 miles from Truckee to the state line. The first grading contract was awarded early in 1924 and work has been under way continuously ever since. Citizens of many sections of the state are planning to join with the commission in celebrating the opening of the highway.

Work on New Roads Taken Over.

Maintenance of the roads taken over on January 1st is now well organized. A high standard has been set and the men in charge are taking an active interest in furthering improvements. Wherever possible with the money available, narrow points are being widened, and drainage and alignment improved, in addition to a well maintained surface.

Rock surfacing under specific authority is proposed for 5 miles east of Marysville, on the Tahoe-Ukiah route; for 5 miles west of Grass Valley on the same route; for 5½ miles, Auburn to Cool, on the Mother Lode highway.

The supervisors of Nevada County have agreed to donate $5,000 per year for five years for use by the commission in improving the Tahoe-Ukiah route from Nevada City to Emigrant Gap. Negotiations also have been completed for the cooperation of Yuba County in rock surfacing a portion of the same route, east of Marysville.

Lake Tahoe Work.

Preparations have been completed for the work proposed at Lake Tahoe this season. Clearing has been under way most of the winter. Removing of stumps will start immediately to be followed by grading and surfacing. About $60,000 of maintenance funds have been allotted for work by state forces.

Plans are in progress for placing a limited amount of rock surfacing on the Donner Lake-Truckee section.

An improvement will be undertaken at once to reduce the hazard at Rattlesnake Creek, south of Grass Valley. Due to sharp curvature and maximum grades at a point sheltered from the sun, and always wet in winter, many accidents have occurred. The sum of $4,000 has been allotted for the work.

On the Mother Lode highway $4,000 will be expended for improving a 1.3 mile section at the notorious Log Town grade.

Plans are in progress for spreading light oil as a dust preventive on about 100 miles of road in Division III during the summer.

The division has installed 41 Redflex signals at danger points this year. During the latter part of 1925, foreman Vance constructed and placed overhead caution signs at the approaches to the Ben Ali crossing of the Southern Pacific railroad near Sacramento.

Tree Planting and Care.

Division III this spring purchased 1400 trees of several varieties from the state nursery for replacement work. Eighty miles of the 92 miles of trees in Division III are on the east side of the Sacramento Valley. Care and maintenance of trees has been placed in charge of a single tree crew under Foreman F. A. Smith. This specialization has proved an economy over the old plan under which the various foremen cared for the trees on their several sections.

The division program for cutting grass and weeds on the right of way, while not as extensive as last year, provides for cutting grass and weeds and burning when justified.

Signs showing the name and address of maintenance foremen are being placed at section boundary points throughout the division.

To reduce inconvenience and danger to traffic due to moving of droves of cattle along the highway, "Stock trail signs" are being placed wherever possible.

DIVISION VII.

HEADQUARTERS, LOS ANGELES.

S. V. CORTELYOU, DIVISION ENGINEER.

Counties of Los Angeles, Ventura, Orange, San Diego, and eastern Kern, south of Mojave.

TWO ROCK slides, aggregating about 15,000 cubic yards, recently occurred on the Coast highway in Ventura County, southerly from Oxnard, adding to the already large quantity of slide material which has come down onto the highway during the past three months. The removal of this material is being carried on by a special maintenance crew equipped with a gasoline power shovel. This crew is also engaged in quarrying and placing heavy riprap rock to protect the highway embankment from ocean waves.

Work is in progress along the paved highway northwesterly from Santa Monica where a maintenance crew is replacing highway embankment washed out during recent storms. Heavy riprap rock is being placed to protect the highway from wave action. This crew is equipped with a power shovel and a fleet of trucks.

which are provided with hydraulic hoists for loading and unloading the heavy rock.

Coast Highway Paving Progresses.

Along the new Coast highway in Orange County, between Newport Beach and Laguna, the laying of concrete pavement was recently started at Corona Del Mar and will be extended to Newport Beach. From Corona Del Mar southerly to Laguna, the rock base for an asphalt macadam pavement has been completed and is awaiting a dry season for the application of asphaltic oil.

On the Jahn and Bressi reconstruction contract in San Diego County the "second story" concrete pavement has been completed from the Las Flores underpass crossing to the north end of the contract near San Onofre. The gasoline tax is providing funds for this work.

From Camarillo to Springville, Ventura County, the old fifteen-foot concrete pavement has been thickened and widened to twenty feet. The mixer has been moved to the Ventura city limits and concrete for the double decking is now being poured in an easterly direction. As a part of this contract a grade change is being made in the vicinity of Beetox, where the grade line will be raised from two to three and a half feet for a distance of several thousand feet, with drainage structures to prevent flood water crossing the highway. This is also a gasoline tax job.

Causeways are Being Removed.

North of Ventura, a maintenance crew under special allotment has commenced work on the removal of the "Long Causeway" from behind the recently completed Rincon concrete seawall. Traffic, which now uses the timber causeway, will be carried on the sand fill back of the seawall, which will be surfaced with quarry waste rock.

DIVISION VIII.

HEADQUARTERS, SAN BERNARDINO.

E. Q. SULLIVAN, DIVISION ENGINEER.

Counties of San Bernardino, Riverside, and Imperial.

THE RECONSTRUCTION contract for the widening of the state highway between Edom and Indio, Riverside County, has been completed. The existing highway has been widened to 20 feet by the addition of cement concrete shoulders on either side of the existing pavement. The improvement has greatly increased the safety of a section of the highway, where, in the past, many accidents have occurred as a result of soft sand shoulders.

Bids are now being asked for additional widening work between Edom and Whitewater, where the existing sixteen-foot highway will be widened to 20 feet by the addition of a single four-foot cement concrete shoulder.

Grading Nearing Completion.

Grading work between Victorville and Daggett on the National Old Trails is about completed and placing of surfacing, now ready to start, will complete a splendid highway.

Considerable maintenance work is under way on the Waterman Canyon road, where alignment is being improved at points and the highway widened at various places.

The equipment department has completed the painting of all the motor vehicles in use by Division VIII, using French gray, the official highway department color.

DIVISION IX.

HEADQUARTERS, BISHOP.

F. G. SOMNER, DIVISION ENGINEER.

Counties of Inyo, Mono, and eastern Kern County, north of Mojave.

A VISIT to the Division "East of the High Sierra" recently by Governor Friend Wm. Richardson was welcomed by citizens of Owens Valley. The Governor was accompanied by his son John, Commissioner N. T. Edwards, Secretary W. F. Mixon and State Highway Engineer R. M. Morton. The inspection trip covered all of the state roads in Division IX as far north as snow conditions would permit, together with the new highway in Kern County along the Kern River via Walker Pass.

At a public meeting in Bishop, at which the Governor was the guest of honor, local speakers commended the commission for recognition of the Mojave-Bridgeport highway as an important traffic artery of the state.

Maintenance forces are now covering all county roads taken over by the commission on January 1, 1926. Following up of the melting snow in Mono County on either side of the Deadman divide will soon be in progress.

The grading contract of Harry Wilson, covering 36.7 miles, Ricardo to Five-Mile Canyon, in Kern County, is completed. Funds have been authorized and preparations are being made for surfacing of this section at an early date.

DIVISION X.

HEADQUARTERS, SACRAMENTO.

R. E. PIERCE, ACTING DIVISION ENGINEER.

Counties of Amador, Calaveras, Alpine, Tuolumne, Stanislaus, San Joaquin, Solano, and southern Sacramento and Yolo counties.

BY THE time this Bulletin is off the press more than half the fill for the new approach to the M street bridge, at the western entrance to Sacramento, will be in place. The H. V. Tucker Company, contractors, are now making rapid progress. The method by which the work is being done is novel in highway grading operations. A floating dredge with a six-yard bucket deposits sand from the Sacramento River on the west levee from which it is sluiced into place by means of a wooden flume. C. W. Springer, assistant resident engineer, is in charge for the state.

Mother Lode Work Commended.

Local residents using the Mother Lode highway between Plymouth and Sonora are commending the commission for the results accomplished by maintenance forces of the division, under the new plan of state maintenance of traversable county roads on state highway routes.

Lumber has been ordered for the reconstruction of the Big Bar bridge on the Mother Lode highway between Jackson and San Andreas. Foreman H. S. Clark will have charge of the work.

A field party has been assigned to the Mother Lode highway for a survey of that section between Drytown and the northerly boundary of Amador County.

The Reason.

What makes us hate the guys who speed,
And cuss 'em and sass 'em?
It's this, I think: We loathe the breed
Because we can not pass 'em.

Time for All Things.

"Hi, gimme a handful of waste!" I howled.
(I was under the auto to grease it.)
But Jim had an armful of waist in the car,
And wasn't disposed to release it.

On!

Are you tired—work on!
Are you slipping—hang on!
Are you standing—move on!
Are you discouraged—hope on!
And, above all—live on!

—*Maine Motorist.*

"KILLED IN THE PERFORMANCE OF HIS DUTY."

IT IS probable the general public does not consider keeping the highways open to traffic a particularly dangerous undertaking. Maintenance men, nevertheless, are constantly risking danger to serve the traveling public.

During a recent storm Frank E. Rais, 30, employed by Division II on the Trinity lateral, was killed by a falling tree, uprooted by a terrific wind. Rais and Foreman Charles Cuff were engaged in an inspection and repair of storm damage in the vicinity of Lewiston, when the accident occurred. The tree crashed through the top of their car without warning.

The deceased workman leaves a widow and a little daughter, also a father and mother who live at Douglas City, Trinity County.

Foreman Cuff's injuries did not prove serious but he suffered considerably from shock. The storm is reported by Division Engineer H. S. Comly to have been the worst in years.

WALLACE SUCCEEDS WOODSON AS ACTING HEAD OF DIVISION VI

ON APRIL 1st, E. E. Wallace, of Division V, became acting division engineer of Division VI, headquarters Fresno, succeeding J. B. Woodson, resigned. The appointment was announced by State Highway Engineer R. M. Morton too late for publication in last month's bulletin.

E. E. Wallace.

Mr. Wallace, who has been assistant divison engineer under L. H. Gibson, is another of the "old timers" on the engineering staff of the commission. His first service was in 1913, when he joined the forces of Division V as draftsman. Later he became chief draftsman of the division, and six and a half years ago was promoted to the position of assistant division engineer which he has held ever since.

During his long service in the latter position he has had extensive experience with both construction and maintenance work on the Coast highway.

Tilton Succeeds Wallace.

George A. Tilton, Jr., who has been with Division V for the last eight years as chief of party and resident engineer, will succeed Mr. Wallace as assistant division engineer. He will have charge, Mr. Gibson announces, particularly of the maintenance work of the division.

SOUTHERN DETOURS LAUDED

THE TIME was when motorists were left to themselves to find a way around construction work as best they could, but highway construction has long since passed that stage. Today, the commission recognizes its duty toward the traveling public demands that detours be provided and kept in travelable condition. The department must operate as well as construct highways.

The following letter comments favorably upon traffic conditions maintained by Division VII in connection with widening and thickening of the Coast highway in San Diego County:

AUTOMOBILE CLUB OF SOUTHERN CALIFORNIA.
137 Broadway.
San Diego, California.

April 8, 1926.

Mr. Spencer V. Cortelyou,
1111 Sun Finance Building,
Los Angeles, California.
Dear Mr. Cortelyou:

Very sorry that I missed you, having found your card in the door this morning when we opened.

It was quite evident to me, however, that you were on the job for the reason that the construction work in northern San Diego County, which practically everybody felt would hinder automobile travel, was so nicely handled that we have heard nothing but compliments and automobile travel has not been hampered nor checked in any way.

Assuring you that we of San Diego County appreciate this very much, and trusting I will have the pleasure of seeing you the next time you are here or when I happen to be in Los Angeles. I am with kindest personal regards,

Very sincerely yours,

(Signed) HAL H. HOBSON,
Representative.

HHH:GC

HIGHWAY NEWS NOTES

THE CLUBHOUSE in William Land Park was the scene recently of a farewell party at which employees of Division X were hosts to Mr. and Mrs. J. C. McLeod, the affair being given in honor of Mr. McLeod, who has resigned as division engineer. During an intermission in the evening's program, Mr. McLeod was presented with a gold watch as a token of the esteem in which he is held by his former associates of the division. Mrs. McLeod was presented with a candelabra.

Nearly forty employees of Division X with their families and friends were present to bid their former chief goodbye. Mr. McLeod is now a member of the firm of Force, Currigan and McLeod, engineers and contractors. Among those present were employees of the division from Sacramento, Stockton, Modesto, Pine Grove, Fairfield and Ione.

W. D. Cook to Take Bride.

Miss Clareene Kimball, stenographer in the offices of Division VIII, has announced her engagement to Mr. Willis D. Cook, superintendent of shop VIII of the equipment department, located in San Bernardino. The wedding will take place in the near future.

The marriage of Miss Edan Meyer, stenographer of Division VIII, to Mr. James Palmer, San Bernardino business man, has been announced.

Highway Clerk Becomes Postmaster.

C. C. Darrow, chief clerk in Division I, headquarters, Willits, has resigned to accept appointment as postmaster at Willits. He has been succeeded by F. L. Meyer.

New Formen Named.

Division III announces the appointment of the following new maintenance foremen:

Wesley Cooper, at Meyers; W. F. Pomeroy, at Tahoe City; Harry Ingraham, at Grass Valley and Ray McCauley at Nevada City, to work under Superintendent Dan Breuning; John Walters, at Coloma under Superintendent H. L. Montfort; Ray Crocker, at Lotus under Superintendent W. H. Miller.

R. K. Forrest, in charge of maintenance work from Auburn to the Nevada line, has resigned.

Miss Ida D. Dawson, for a long period an employee of the Equipment Department at the Sacramento office, was married recently to Rev. S. M. Reiste. They will make their home in Iowa.

"Another Nash."

A. M. Nash, chief draftsman with Division X, proudly announces Ann Elizabeth Nash, who weighed 9 pounds 2 ounces upon her arrival, April 5th.

T. M. Joyce, formerly foreman at Sonora, Division X, under S. E. Harris, has been placed in charge of maintenance work on the Mother Lode highway between Angeles Camp and Sonora and on the Sonora Pass route from the westerly boundary of Tuolumne County to a point eight miles east of Sonora.

H. S. Clark, formerly subforman at Stockton, has been promoted to the position of foreman to succeed J. W. Bertram, who has been transferred to Division III with headquarters at Auburn.

HAVE YOU ANY BACK COPIES OF THE BULLETIN?

BECAUSE of the limited editions printed and the heavy demand for early copies of CALIFORNIA HIGHWAYS, headquarters is in need of copies of the January, February, March, April, May and June issues of 1924 to complete files.

If any of our readers have copies of these issues which they do not want, we would be glad to have them and will repay postage necessary to send them to Sacramento. Address, California Highway Commission, P. O. Box 1103, Sacramento, Cal.

COMMENDATION FOR WORK OF VENTURA MAINTENANCE FOREMAN

THE PERIOD of recent storm was a trying time for maintenance crews, particularly the men caring for highways in the southern counties. How well the responsibility for keeping traffic moving was met by a maintenance foreman of Division VII, the following letter will evidence:

THE SAMUEL EDWARDS ASSOCIATES.
(A Corporation.)
Santa Paula, California.

April 15, 1926.

Mr. W. F. Mixon, Secretary,
California Highway Commission.
Sacramento, California.

Dear Sir:

No doubt you frequently have letters commenting on the work under your commission.

In this case I want particularly to send you one of commendation of the activities of your maintenance foreman for Ventura County, Mr. L. B. Prosper. It was my fortune or misfortune to have to travel the Rincon road during the day of the storm last week, and I know from long experience in travelling that particular stretch of the highway, that those on the road that day experienced one of the most trying times that I recall. Traffic was kept going through the good judgment of Mr. Prosper in directing the work.

I send this along purely because I think it is only proper that instances of this kind should be called to your attention when they are a little out of the ordinary.

Very truly yours,

(Signed) ROGER W. EDWARDS.

ACTING ENGINEERS PROMOTED

IN ADDITION to changes in Divisions V and VI, other promotions in the state highway organization announced recently by State Highway Engineer R. M. Morton are as follows:

F. W. HASELWOOD, Division III, headquarters, Sacramento, from acting division engineer to be Division Engineer.

E. Q. SULLIVAN, Division VIII, headquarters, San Bernardino, from acting division engineer to be Division Engineer.

Long Service for State.

Division Engineer Haselwood first entered the service of the state highway department on January 1, 1912 as chief of party in Division I, the Redwood Highway division. Later he was with the bridge department, and in 1924 was named acting division engineer in Division III.

Mr. Sullivan began his career with the department in 1914 as assistant resident engineer in Division II, where he worked on the Pacific Highway and lateral roads. He has been in charge of state highway work in the counties of San Bernardino, Riverside and Imperial since the creation of Division VIII in 1923.

FLOWERS THAT BLOOM IN THE SPRING

Uncontrollable longings to be on the move
The warm April breezes now bring;
The downtrodden draftsman does longingly think
Of the flowers that bloom in the Spring.

He envies the fieldmen, who blithely and gay
Punch their stakes as they happily sing,
And he pines to pick bouquets and ramble around
'Midst the flowers that bloom in the Spring.

The maintenance man gets out graders and rakes
Tractors, shovels, all tools—everything!
And he scrapes from the shoulder and clears from the ditch
The flowers that bloom in the Spring.

The surface he smooths and the ruts he fills up
For he knows that warm weather will bring
The Stars and the Fords and their owners to pick
All the flowers that bloom in the Spring.

And when they've departed he comes with a truck
Behind which a trailer does swing
And gathers the litter thy've left in exchange
For the flowers that bloom in the Spring.

At headquarters, too, the fever is felt
From the itch they are all suffering,
On the slimmest excuse they depart to enjoy
The flowers that bloom in the Spring.

The departmental chairs are vacant for weeks
The desks piled with letters that bring
From divisions requests, that have nothing to do
With the flowers that bloom in the Spring.

The "D. E." keeps wond'ring why he doesn't hear;
Why the mail doesn't bring anything
To settle the matter and let him commune,
With the flowers that bloom in the Spring.

C. S. P., G. R. W., and T. E. S., too,
Never pass up a chance for a fling
Or a chance for a look—it's a strenous trip!—
At the flowers that bloom in the Spring.

But they're not alone, all the others, as well,
At their desk, wait the telephone's ring
With the hope they'll be called on a far distant trip
Through the flowers that bloom in the Spring.

R. M. M., of them all, seems immune to the spell,
Undisturbed by the Spring's whispering;
But he takes it all out on his garden at home,
Raising flowers that bloom in the Spring.

You impatiently ask, what this all has to do
With State Highways? I say—"Everything!"
We need to be roused from our long winter nap
By the flowers that bloom in the Spring.

We need inspiration and pep in our work,
To our minds new ideas it will bring
To better our roads, so the folks can enjoy
The flowers that bloom in the Spring.

But lest we disturb by this blather and hlurb
The scribe will cease further to sing
As the words outward surge, there's relief from the urge
Caused by flowers that bloom in the Spring.

F. J. GRUMM.

DOUGLAS MEMORIAL BRIDGE TO BE DEDICATED MAY 17th

AS DIRECTED by the terms of the legislative act making an appropriation for its construction, the California Highway Commission is preparing appropriate exercises for the dedication of the great Klamath River bridge, in Del Norte County to the memory of Dr. G. H. Douglas, former Assemblyman from the first district. The date has been definitely set for Monday, May 17th.

Governor Walter M. Pierce of Oregon has accepted the invitation of Governor Richardson to join him in taking part in the dedication. Other officials and organizations which will join with the California Commission in the dedicatory ceremonies are:

Oregon Highway Commission, Boards of Supervisors of Del Norte and Humboldt counties; Chambers of Commerce of Crescent City and Eureka; Redwood Highway Association; Save the Redwoods League; The Cave Men of Grants Pass; and the California Press Association.

The Bulletin, in the May issue, will publish details of the program and will reproduce the latest photographs of the bridge, which is the largest and most beautiful on the state highway system.

STATE HIGHWAY FUND CONTRACTS (Bond Funds, Including Federal Aid)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE MARCH 17, 1926.						
480	X	Yolo	6	C	At Washington		Underpass S. N. R. R. crossing	Lord and Bishop	$25,064 55	Sept. 3, 1925	
					AWARDED SINCE MARCH 17, 1926.						
496	V	San Luis Obispo	2	F	Across the Santa Maria River 2 miles N. of Santa Maria		Reinforced Concrete Girder Bridge	Rocca and Caletti	$126,832 95	April 5, 1926	200
					Sub-total				$126,832 95		
					PENDING AWARD—None.						
					Total State Highway Fund Contracts Awarded and Pending Award				$126,832 95		

NOTE.—Primary construction covered by the above contracts does not include funds obligated on cooperative forest highway projects, prison camp road activities, or day labor jobs not being done under contract.

STATE HIGHWAY MAINTENANCE FUND CONTRACTS (Including Gasoline Tax Fund)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE MARCH 17, 1926.						
M-57	II	Shasta	3	C	Halfway Creek to Dog Creek	10.84	Grading and Rock Surfacing	Nevada Contracting Co.	$454,628 25	Jan. 3 1925	
M-96	VIII	Riverside	26	E	Edom to Indio	11.43	P. C. C. Pavement widening	Basich Bros. Co.	117,943 54	July 29, 1925	
					AWARDED SINCE MARCH 17, 1926.						
M-115	VII	Los Angeles	2	B	At Chalk Hill	0.70	Grading and Bit. Mac. Pavement	H. A. McCray	$50,603 92	April 5, 1926	100
M-116	VII	Los Angeles	2	D	Across the Rio Hondo near Los Angeles		Widen existiog steel bridge	Gutleben Bros.	96,545 81	April 5, 1926	125
M-117	IV	Contra Costa	14	A	Across San Pablo Creek at San Pablo		Reinf. Concrete Girder Bridge	R. B. McKenzie	$23,231 00	April 23, 1926	100
M-118	II	Shasta	3	C	Between Dog Creek and Lamoine	4.5	Grading and Rock Surfacing	George Pollack Co.	306,673 00	April 23, 1926	200
M-119	X	Stanislaus	4	B	Between Modesto and the Stanislaus River	7.8	P. C. C. Widening and A. C. Surfacing	Valley Paving & Const. Co.	183,916 00	April 23, 1926	150
M-120	VI	Madera	4	A	Between Borden and Madera	2.19	P. C. C. Pavement Widening	Hanrahan Co.	20,185 00	April 23, 1926	90
M-121	IV	Sonoma	8	B	Between Vineburg Junction and East County line	1.0	Grading and Bit. Macadam Surface	W. H. Hauser	11,742 00	April 23, 1926	50
					Sub-total	16.19			$692,896 73		
					PENDING AWARD—None.						
					Total State Highway Maintenance Fund Contracts Awarded and Pending Award	16.19			$692,896 73		

NOTE.—The above obligations charged against the State Higbway Maintenance Funds do not include funds from these sources obligated for general maintenance and for specific betterments being done under day labor authorization.

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CALIFORNIA HIGHWAYS

A BULLETIN ISSUED BY THE CALIFORNIA HIGHWAY COMMISSION FOR THE INFORMATION OF ITS EMPLOYEES AND THE PUBLIC

Vol. 3 · MAY, 1926 · No. 5

IN SMITH RIVER CANYON—The newest section of the Redwood highway in California is the cooperative forest project recently opened to traffic between Adams Station and the Oregon line, Del Norte County. Construction was under direction of the United States Bureau of Public Roads, the state advancing half the cost.

In this issue: INCREASING THE SAFETY OF STATE HIGHWAYS.

CALIFORNIA HIGHWAYS

HARVEY M. TOY, Chairman;

N. T. EDWARDS and LOUIS EVERDING, Commissioners.

ROBERT M. MORTON, State Highway Engineer.

W. F. MIXON, Secretary.

We are pleased to permit publication of any of the matter contained herein or to loan cuts, and this privilege is extended newspapers and periodicals without restrictions.

FRANK B. DURKEE - - - Editor

P. O. Box 1103, Sacramento, California.

Vol. 3 MAY 1926. No. 5

CALIFORNIA HIGHWAY DEPARTMENT

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CALIFORNIA HIGHWAY COMMISSION

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LOUIS EVERDING, Commissioner, Arcata

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R. E. PIERCE (Acting), Division X, Sacramento

General Headquarters, Fifth Floor, Forum Bldg., Sacramento

THE FOLLOWING principles should be axiomatic with every engineer in the highway department. Experience, the great teacher, eventually hammers these truths home to all.

The proper location should be used, regardless of private property or existing highway improvements. Ten years from now, future development will show up instances of improper locations.

Alignment should be so planned as to permit of high speed. Some day there will be no speed limits on most public highways.

Real money should be put into the foundation and its suitability should not be taken for granted. The paving to be laid is not a foundation, whether it be oil macadam, asphaltic concrete, or hydraulic cement concrete. Foundations are perfected by weather, time and traffic, acting on the prepared earth roadbed, and these factors are more important than the rolling and compacting operations which can be performed during construction.

Subgrades Should be Studied.

Unstable soils should be avoided. No pavements should be placed on soils which shrink and swell without precautions to minimize these dangerous characteristics.

Widths of pavement should be ample to provide for traffic increase. A factor of safety is used in every other kind of engineering construction, including bridges and buildings. A factor of safety should be used in planning pavement width.

Quality is more popular with the public and will insure future continuation of highway construction, more surely than long mileage inadequately improved.

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MAY 1926 | California Highways | VOL. 3 No. 5

INCREASING THE SAFETY OF STATE HIGHWAYS

By R. M. Morton, State Highway Engineer.

(Editor's Note: The following abstract is from a paper read before the annual convention of the California Supervisors' Association, at San Diego, California, March 11, 1926.)

INASMUCH as one in three persons in California is responsible for the operation of a motor car, the subject of safety on the public highways is of constant public interest. There are perhaps three classes of danger which threaten the motorist.

First: Weaknesses in his vehicle itself. Records show that a prolific source of accident are those from worn tires, the breaking of wheels, the crystallizing of steering arms or axles. From this class of trouble the road builder can not be held responsible.

A second class of accidents is caused by the incompetent or irresponsible driver, who is an ever present menace to himself and to all others. Until some system is inaugurated for mental tests for operators, which will weed out the physically and mentally unfit, automobile driving will contain a large element of danger.

The third class of accidents includes those for which road conditions must share in the responsibility. This cause is inseparably related to the second, for the safe and careful driver tries to adjust his control of the machine to the highway conditions which he perceives immediately before him. However, in California, with the large mileage of smooth straight roads and the generous legal speed limit, the motorist has gradually come to believe in his right to proceed at the maximum of the legal rate of speed over the highway surface, in any location outside of cities and built-up sections. The universal use of the automobile for the transaction of every kind of business and pleasure has created public demand for safety in the highways. The efforts of the road building agencies, both county and state, to provide smooth, hard surfaces, capable of sustaining high speeds, is generally taken by the motorist as a recognition of his rights to proceed at the maximum speed which the law allows. The motorist has gradually become more exacting in his demands regarding all details of highway improvement.

Experience Shows Dangers.

Improved highway construction in California has had crowded into its fifteen years of intensive history, a vast wealth of experience, example and precedent as to safety details. The state and county highway builders are better able now than ever before to state in exact terms what details constitute danger in highways.

There are many details in the design of highways which have little influence on their efficiency for slow moving traffic, but which threaten the safety of the fast moving vehicle. At low speeds almost any improved highway is safe, assuming a good car and an experienced driver who has the ordinary co-relation of his senses. However, now it is for the faster traffic that we must design our highways, if we desire to reduce danger to a minimum.

The ideal highway should have sufficient width to accommodate the pavement, plus a margin of usable width to permit a car to get completely off the pavement at all points. The Motor Vehicle Act makes it a misdemeanor for a car to stop for repairs on the paved portion of the roadway, and the time is at hand when this provision should be more strictly enforced. There is no more serious menace to traffic than a car stopped on the pavement. It is an invitation to death for the persons in the car which is stopped. Many an accident has been caused by the meeting of two other vehicles at a point opposite the disabled car. At night it is doubly a menace, for it is often impossible to know quickly when approaching a red tail light, whether the car is stopped or is moving.

If a shoulder wide enough to permit of parking clear of the pavement is not provided by the road builder, the motorist is forced to stop upon the pavement.

Borrow Pits Menace.

We now know that the high grade with deep borrow pits scooped out in the right of way is often a death trap for the motorist. So

(Continued on next page.)

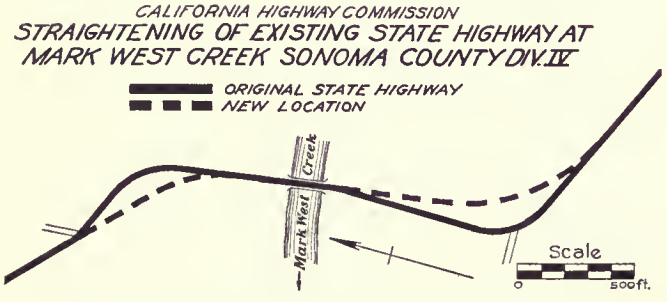
OPENING THE ECHO SUMMIT—Scenes taken recently in Division III when maintenance crews opened the Echo summit to travel on the road from Placerville to Lake Tahoe. At left, tractor towing grader and two cars up Meyers grade. (Photo by Division III.)

INCREASING THE SAFETY OF STATE HIGHWAYS

(Continued from page 3.)

many accidents occur on account of these deep borrow pits that it is almost axiomatic in the state highway department that they are not to be constructed. Although drainage provisions are usually necessary, in country which seems to require construction by means of deep borrows on the sides, the excavation often greatly exceeds drainage necessities. When a grade is built by robbing the roadside, the drainage conditions are usually made worse instead of better, because ponds of water stand in the borrow pits, to the future detriment of the roadbed.

No road should be paved to a less width than 18 feet. Traffic on all of our public highways is now reaching a point where two lines must be provided. However, the 18-foot width of roadway does not provide any factor of safety to permit the free, easy, and safe passage of an automobile and a wide truck or stage. The pavement is built to take the traffic, and the road builder can not assume that the driver of one vehicle should get half way off the pavement to pass a wide load. Widths of 20 feet are considered to be necessary if we are to look a little to the future,



and assume the greater use of highways which is bound to come.

The junction between the firm material of a hard pavement, and the earth of the grade, is a great danger point on all paved roads, and a fruitful source of accident to the motorist. In rainy weather, if he leaves the pavement with one wheel to pass a vehicle, he sinks into the soft slippery shoulder, then endeavors to climb back by a quick turn on the steering wheel. Sometimes he goes across the pavement into the other traffic lane, thereby endangering the lives and property of those using that side of the road. Many accidents occur on low soft shoulders by the car overturning before its wheels climb back to the pavement.

This is a situation which road builders should not tolerate and can do much to prevent. It is the endeavor of the state to protect the edge of all new pavements by an additional two feet of crushed rock. The purpose of this is to widen the usable hard surface, as well as to create a transition area, the outside edge of which will not be so rigid or so abrupt as the edge of the hard pavement.

A good means of keeping traffic off the shoulders of the highway is to supplement with rock the width of the pavement and to permit vegetation to grow on the sides. It is noticed that motorists are much more careful to keep off the grass than off a smooth appearing earth shoulder. This reduces maintenance expense and at the same time it increases safety by encouraging more careful driving.

Safe Curves Appreciated.

Curvature in road alignment has ceased to be a pet of the engineer, used by him only to cause right of way difficulties for the supervisors. The motoring public has become educated to the difference between a 100-foot radius curve and 300, 500 or a 1000 foot. He knows there are certain bad bends which require reducing his average speed to one half, and that there are others around which he can travel without slackening. He appreciates the safe curve. A highly superelevated curve of 300-foot radius is about the minimum which the average driven can safely negotiate at a speed of 35 miles per hour. The center of a 300-foot radius curve at a right angle corner will lie about 125 feet from the intersection of the two straight lines. A 500-foot radius curve will lie about 200 feet in from the intersection of the two straight lines.

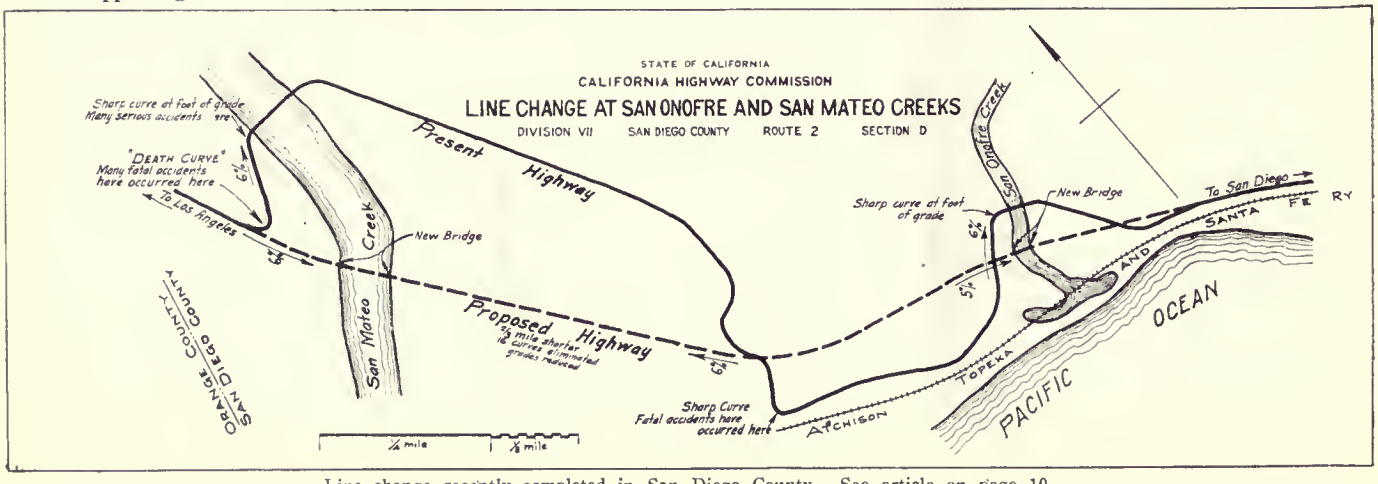
When first considered, the idea of taking valuable property just to ease up a corner for the speeding motorist may seem unreasonable, but these and even more drastic lines are necessary to build real safety into the roads. If the highway is to be paved, there will be an actual saving in length of pavement by installing a 500-foot radius curve instead of building a right angle of over 200 feet in length. At $4 per lineal foot for the pavement, this amounts to over $800 saving in cost of paving construction, which can be devoted to procuring the new right of way. On a curve of 1000-foot radius in such a location, the difference in length of pavement would be over 400 feet, which at the same rate would permit of $1,600 being devoted to procuring new right of way.

Superelevation is another semitechnical term loved by the engineer and by the motorist. It means simply the banking, or raising of the roadbed on the outside, to make the car lean to the inside as it passes around the curve. Combined with the force of gravity and the centrifugal force, a properly banked curve keeps the center of gravity of the car properly spaced between the wheels in contact with the roadbed. Railroad tracks are laid out with superelevation on the curves, thereby permitting high speed trains to take them without slackening speed.

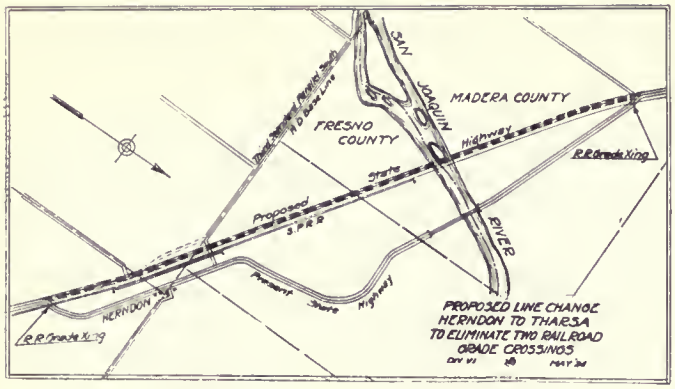
The necessity of superelevation, as a safety measure on the public highways, is now a well learned lesson.

Importance of "Sight Distance."

The term "Sight Distance" denotes the distance which the motorist traveling on the right side of the road can see past an obstruction, to sight an approaching car. Human beings differ in their time of recording sensations on the brain and getting the muscles into action. Some drivers are slow in their reflexes. A car moving at 30 miles per hour travels 44 feet in one second; at 40 miles per hour it travels 50 feet in one second. Assuming that two cars are approaching each other at 30 miles per hour around a curve, the distance between them is lessened by 44 feet in one second for each car, or at a combined rate of 88 feet per second. Therefore, with a sight distance of 88 feet on the curve, there would be one second for the senses of the drivers to act, for the muscles to act, and for the vehicles to respond and pass safely. Any such small distance is entirely too short to permit of a speed of 30 miles per hour. The average driver will require one second to adjust himself, one second should be allowed for the vehicle to respond, and there ought to be one second to spare. Therefore, a sight distance of 300 feet is the minimum which can be considered really safe. Even around curves from which obstructions have



Line change recently completed in San Diego County. See article on page 10.



been removed to make a sight distance of 300 feet, speeds greater than 30 miles per hour are hazardous. Sight distances must be increased to four or even five hundred feet in order to permit of safe travel at a speed of forty miles per hour.

Sight distance also comes into the calculations of the road builder on vertical curves, where two cars will approach the crest of a hill from opposite sides. In such cases curvature should be such that there is as long a sight distance as possible. To pass a vehicle going in the same direction when approaching the crest of a hill is always dangerous, until the driver has a clear view of the road ahead over the top of the hill. Good practcie requires that the crest of the hills be lowered by means of long, flat vertical curves.

The problem of railroad grade crossings has consumed the time of many committees during the past few years. The grade crossing catches good and poor drivers alike. There is only one safe rule for the motorist in approaching a grade crossing, that is, to slow down to a speed which permits him to carefully look in each direction when still at a good distance from the crossing, and assure himself personally that a train is not approaching. Warning signs, bells, human flagmen, wigwags, and even traffic gates do not protect the motorist who does not take this common sense precaution. We sometimes say that he kills himself, but that does not repair the loss sustained by society when a carload of passengers is wiped out in an instant. The Railroad Commission of this state has adopted a policy of refusing to open grade crossings except when another is closed.

Grade Crossings Part of Improvement.

There is one good rule for the highway builder, and that is, to never improve a highway at grade across a main line railroad. If the highway is worth building, it must be because of the amount of traffic, and if the amount of traffic justifies building the highway, it usually justifies going a little farther and planning a grade separation to be constructed along with the highway project.

The practice which has become fairly standard in California is to assess one-half the cost of the project to the railroad, the other half being borne by the public. Although this phase of highway work is expensive, and adds to the number of major structures which must be built, there is nothing which is more appreciated.

The points above enumerated, which make for safety, have to do entirely with the designing and building of the road. They include the width of grade and pavement, the avoidance of death trap borrow pits, treatment of the shoulders, the alignment of the road, superelevation of the surfacing, sight distance on curves, and railroad separations. If a highway is well laid out with due attention to all of these details, the road builder has gone far in safeguarding the user of the highway. There are additional minor safety measures, the need for which should be studied by the road builder after the highway is in operation. These are improvements or betterments of a minor nature, which contribute added safety for fast traveling motorists.

One very important measure, which is highly conductive to safety, is the center guide line, which divides the pavement into traffic lanes. This is a great help to the motorist, both day and night, for it marks off a certain width for his exclusive use, and he proceeds with the assurance that the approaching motorist, desiring similar courtesy, will not encroach upon his side of the road. Workmanlike guide lines are not easily installed. White paint makes the best guide line on either cement or asphalt surface, at a cost of from $40 to $50 per mile. Black guide lines of asphalt paint can be installed for $10 per mile or less, where there is much of it to do.

A white guard rail of substantial character looming up at night is a true friend of the motorist. He should have the same feeling to it that the mariner has to the lighthouse on an unfamiliar sea. Guard rail, to be really woth while, should be sufficiently substantial that it will successfully resist an occasional sideswipe. The state of Pennsylvania standardizes on the use of heavy cables on extra heavy wooden posts. This guard is considered practically unbreakable, and I am informed that even trucks do not go through the heavy type. Even a light guard rail, however, is entirely serviceable as an indicator of danger. The motorist highly appreciates this installation made for his particular benefit. The guard rail now standardized on California state highways consists of 8 x 8 posts, 6 feet apart, and 6 x 6 rail, and costs from 80 cents to $1 per lineal foot.

Flasher signals, many of which have been installed by the automobile clubs and associations, in some cases with financial aid from the counties, are a valuable safety device. The presence of a danger spot or a sharp turn in the road is indicated by these flashers, and many lives have been saved by the advance information thus given to the driver of a car.

The reflecting lenses, many of which have been installed both on state and county highways, are a great help in night driving, and are well worth their cost.

Safety Should be Built into Highways.

The question as to how much a county can afford to spend on the installation of safety devices can be answered from two different angles. The first answer is that safety should be built into the highways. A road alignment which is safe usually costs little more than one which is unsafe. The right of way expense, often magnified to be a serious item, in many cases is overbalanced by the savings to be made in reduction of distance. The wound caused by obtaining proper right of way is rarely deep and soon heals.

The adoption of adequate pavement width is an economy so far as future maintenance is concerned because of the distribution of traffic over a greater road surface, which prevents the concentration which tends to break up a narrower pavement.

Grades should be intelligently laid. Materials should be hauled in for making fills instead of scooping out borrow pits. Obstructions to sight should not be permitted. Grade curves over summits should be long and flat. Buildings, poles or other encroachments, including trees in the line of sight, which endanger the life of the motorist, should be kept clear of the roadway.

The other answer is in the close study of each mile of constructed road, its traffic and its accidents. Many of these can be prevented by relatively inexpensive installations of guard rails, flash warning or reflector signs, and traffic guide markers.

The counties of this state, excluding Los Angeles and San Francisco, in 1925 received an average of about $100,000 each from the gas tax and motor vehicle license fees. Los Angeles County paid 40 per cent of the approximate $20,000,000 total of receipts from license and gas tax, and received back for its own expenditure 20 per cent, or $4,000,000. San Francisco County paid 8 per cent of the total amount collected and received back 4 per cent, or about $800,000. The average return to the balance of the counties of the state was almost $100,000. This fund contributed by the motorist could well be expended in each county in making the highways safer for motor travel.

TRUCKEE RIVER HIGHWAY TO BE DEDICATED IN JUNE

GRADING of the Truckee River highway, the new scenic route from Truckee along the river to the Nevada line and Reno, has been completed. The new highway will be dedicated to the use of the public on June 10th by officials of the commission and a great caravan of Californians, who are making a trip over the Victory highway from San Francisco to Salt Lake City, leaving San Francisco on June 9th.

The caravan will be headed by Chairman Harvey M. Toy and a delegation of San Francisco business men and officials of the California State Automobile Association and the Utah-Nevada-California Highway Association.

Commissioners Louis Everding and Nelson T. Edwards and their wives also will accompany the caravan to Salt Lake. State Highway Engineer R. M. Morton will inspect the work, returning after the ceremonies at the California-Nevada line.

The Bulletin, in the June issue, will give details of the project.

CONTRACT NUMBER I, REBUILT AFTER SERVICE OF MORE THAN TWELVE YEARS, AFFORDS INTERESTING COMPARISONS

CONTRACT No. I BEFORE AND AFTER RECONSTRUCTION—Peninsula highway between Cypress Lawn Cemetery and San Bruno, San Mateo County, including sections of Contract Number 1, recently reconstructed. (1) Before rebuilding; (1-a) widened pavement, same location, with heavy cement concrete shoulders for truck traffic; (2) old highway near Cypress Lawn; (2-a) widened highway at same point; (3) near San Bruno; (3-a) same point with dangerous drainage structure widened to promote safety; (4) through San Bruno; (4-a) widened highway at same point. (Photos by Division IV.)

THE FIRST contract ever awarded by the California Highway Commission was for the placing of a pavement twenty-four feet in width on the Peninsula highway, in the vicinity of Cypress Lawn cemetery and San Bruno, San Mateo County, Division IV. The recent rebuilding of this section affords engineers some interesting comparisons between methods followed in 1912 and 1913 and today.

A study of the final report on Contract Number I reveals that the specifications provided for a cement concrete base, twenty-four feet wide, surfaced with sheet asphalt to a thickness of one to 1½ inches. The concrete put down was known as Class C and the proportions were: 1 part cement, 3 parts sand and 6 parts gravel. Engineers were "careful to see that it was kept moist for not less than five days after placing." The mix was what was termed "wet" concrete. "Standard" Portland cement was used, with "Keystone" sand and "Niles" gravel for the greater part of the job.

The "Standard" asphaltic surfacing had an average penetration of 70 degrees and daily samples were taken and shipped to a testing laboratory in Sacramento. The pavement was placed with a decided crown of several inches.

Despite these specifications, which would be held inadequate today, Contract Number I held up remarkably well under the extremely heavy traffic of the Pininsula highway. It was not so much the condition of the pavement as the necessity for a wider street that caused its widening to forty feet under the contract recently completed.

First Contractor Had Troubles.

Contract Number I was for 5.4 miles and was awarded to F. R. Ritchie on July 23, 1912. A subcontractor began building the grade, which was to be forty feet wide, August 5, 1912. In November of the same year the contractor assigned the contract to his bondsmen, who turned it over to the Ransome-Crummey Company of Oakland for completion. The latter firm began work on November 27, 1912 and completed the project on June 26, 1913.

The final cost to the state was $97,002. The estimate of the then Division Engineer A. E. Loder was $100,001.81 and the original bid of Ritchie, which was the lowest of thirteen bids, was $89,369. L. L. Clark was resident engineer for the state.

Much has been learned concerning road building since the days of the first state highway contract. Today California concrete pavement specifications provide for 1 part of cement, to 1.8 parts of sand, to 3.6 parts of rock, proportioned by the most exact methods. The proper amount of water is most carefully determined and measured. Concrete pavements are cured for a period

of fourteen days by "ponding," as compared with the five days wetting down of thirteen years ago. Asphaltic concrete surfacing must have a penetration of 40 to 50 degrees and sheet asphalt surfaces are no longer placed on state highways. A roughened surface has been devised which lessens skidding, contributing to the safety of travel. Crown has been practically eliminated in the interests of safety.

How Pavement was Rebuilt.

The pavement placed under Contract Number I was widened to forty feet by placing eight-foot cement concrete shoulders on either side of the existing pavement, eight inches thick in the center with ten-inch edges. They were placed about 2½ inches above the surfacing of the existing pavement, which was resurfaced with asphalt concrete 2½ inches thick at the edge of the old slab and decreasing in thickness to about one inch in the center, thus removing the extreme crown of the old road.

From San Bruno to Baden, the asphaltic surfacing consists of wedges on each side of the old pavement about 1¾ inches thick at the edge and thinning out approximately six feet either side of the center line. This plan also reduces the crown where a thicker pavement was not deemed necessary.

Standard superelevation was used on all curves and here the wedges of asphalt are considerably thicker. In addition, a five-foot rock and earth shoulder was constructed on either side of the widened pavement, making a clear roadway width of fifty feet. Drainage structures also were lengthened to conform to the new width. The latter improvement alone removed several bad hazards from this section of the highway.

Modern Methods of Reconstruction.

Under the heading, "TAKING THE GUESS OUT OF MIXING CONCRETE," R. E. Messner, resident engineer on the project for Division IV, has the following to say concerning methods devised by the Federal Paving Company to conform to present day specifications of the commission:

> "One of the most modern central concrete mixing plants in the west was operated in connection with construction of concrete shoulders on the Peninsula highway between Cypress Lawn Cemetery and San Bruno, San Mateo County.
>
> Specifications for proportioning the aggregate for hydraulic concrete require that the materials be delivered to the concrete mixer, separately in three different sizes, viz: 2½- to 1¼-inch rock; 1¼- to ¼-inch rock; and sand, the rock to be measured by volume and the sand to be measured by weight or by volume in a state of inundation.
>
> Aggregates were unloaded from the cars directly into a three-compartment bunker, each compartment having a capacity of 40 cubic yards (1 carload) by use of ¾-yard clam-shell crane.
>
> The coarse aggregates were measured in Johnson adjustable measuring hoppers placed on the bottom of the bunkers. These hoppers were carefully measured and their cubical contents computed and a table made showing the capacity for the various adjustments, which were made by a special homemade caliper scale. Sand was weighed in a weigh box similar to that used for measuring aggregates at an asphalt plant. The aggregate was then transported to the hopper of a 21 E 5-sack capacity Koehring concrete mixer by use of a belt conveyor 24 inches wide with the outer 4 inches set at an inclination of 30 degrees and traveling at a speed of 275 feet per minute. Cement was placed in the mixer hopper between the coarse aggregate and the sand.
>
> **Automatic Water Control.**
>
> The concrete mixer was equipped with an automatic timing device which locked the outlet lever of the mixer until all aggregate had been mixed for the required time. The mixer was also equipped with an automatic water control system which measured the required amount of water to be used per batch. The water tank was carefully measured and a table of its contents made by graduating the water glass installed outside of the tank.
>
> It was found that the adjusting device, provided by the manufacturer for measuring the water, was not graduated to sufficient refinement; therefore a turn buckle was attached to the handle of the vernier to permit a more exact adjustment.
>
> All aggregate was furnished by the California Rock Company from its Eliot plant in Alameda Creek. Samples were taken from each carload of aggregate and screened, which soon enabled the company to furnish aggregates which produced an ideal grading.
>
> The adjustable measuring hoppers, the sand weigh box, the automatic water control system, the timing device controlling the time of mixing, and the constant screen analysis of the aggregates took the guess out of mixing concrete. Every batch left the mixer with approximately the same grading of aggregate and the same amount of water. The only adjustment to be made was for moisture content in the aggregates."

The approximate cost of the reconstruction was $250,000. The gasoline tax provided the funds.

FRESNO ENGINEER COMMENTS ON LATERAL MAINTENANCE

AS AUTHORIZED by the legislature at its 1925 session, the commission, on January 1st, began the maintenance of all existing county roads on state highway routes. Considerable already has been accomplished in the interests of the traveling public.

How the work in Fresno County appeals to the county road building authorities, the following letter will testify:

CHRIS P. JENSEN
COUNTY SURVEYOR
FRESNO, CALIFORNIA

April 20, 1926.

Mr. Robert M. Morton,
State Highway Engineer,
Sacramento, California.

Dear Mr. Morton:

I went over that portion of the Coalinga-San Lucas highway lying within Fresno County, yesterday.

I wish to take the opportunity to compliment you upon the manner in which you have undertaken the maintenance of that portion of the highway which has not been affected by *any* reconstruction program. Your men are taking every opportunity to widen the road as much as possible with the grader, which together with the grading and crowning, produces a most noticeable improvement.

It was very gratifying to me to see the results, and I am sure that the county as a whole will be duly appreciative of your efforts.

With best regards, I beg to remain

Very truly yours,

(Signed) CHRIS P. JENSEN,
County Surveyor.

TRAFFIC INSURANCE

(From the Monterey Herald.)

MONTEREY County, under the guidance of its county engineer and board of supervisors, has adopted a far-sighted position toward highway development.

Dr. John L. D. Roberts, supervisor, who has done so much for this district, aims for eighty-foot rights of way for all main county roads—the same standard that has been the objective of the *State Highway Commission*.

That is *traffic insurance* for the Monterey peninsula five, ten and twenty years from now—a common sense provision practical today before further building and private improvements make highway widening prohibitive.

Great Klamath River Bridge, Memorial to Assemblyman Douglas, to Bi

HISTORY OF KLAMATH RIVER BRIDGE PROJECT

(From the memorial program prepared by the commission.)

FORTY-FIVE miles south of the California-Oregon state line, the waters of the great Klamath River merge with those of the Pacific Ocean. The Klamath is one of the least known rivers of California. Rising at a high altitude in the snows of the Cascade Mountains which surround the Klamath Lake region in southern Oregon, it flows for almost its entire length through deep, rugged canyons and virgin forests of giant trees.

The Klamath is bridged in but few places. Most of the existing bridges are of the suspension type, built high above the waters, which sometimes rise as much as forty feet in flood stage. This great river, with its antiquated ferries, operating only in fair weather, has been a barrier which has effectively isolated Del Norte County from the remainder of the state.

The late Dr. Douglas was persistent in his efforts to obtain recognition of the necessity for a great bridge near the mouth of the river which would link Del Norte County with the improved highway system of the balance of the state, and indications pointed to his success during the 1923 session of the legislature. However, before the culmination of his efforts, he died suddenly in Sacramento, mourned by all who knew him.

The untimely death of Dr. Douglas sharply impressed the necessity for the bridge upon the attention of his colleagues in the legislature. Governor Richardson had previously approved the project, and under a suspension of the rules, the bill which Dr. Douglas had introduced was passed and signed. It appropriated $225,000, not only to reward his efforts in representing his community, but to construct a fitting memorial to his memory.

Bridge Considered for Many Years.

The bridging of the Klamath River, thereby connecting Route No. 1 throughout its length, has long been an ambition of the engineers of the California Highway Commission. Surveys, studies, and soundings have been made during the past ten years, preliminary to deciding upon the type of bridge and the proper location. The route was authorized by the 1909 highway bond issue; the Highway Commission was, therefore, able to supplement with bond funds the appropriation provided by the legislature. The special appropriation of $225,000 made the bridge possible, although the contract was awarded for $391,000.

The Douglas Bridge spans the Klamath about three miles from its mouth, at a point where the river is nearly a quarter of a mile wide. Heretofore, the river has been crossed by a small ferry which could not be operated at times of extreme high or extreme low water.

Steel was the structural material first considered for construction of the bridge, but when the memorial features were introduced, it was decided the structure should be of concrete. The bridge, now approaching completion, will be ready for final acceptance later in the summer. It consists of five main arch spans, each 210 feet in length, with short approach spans at each end. In some respects the structure is unique, and the only one of its kind in the world. It is the largest on the California highway system.

Much objection was presented by engineers to prove the impossibility of bridging the wild floods of the Klamath River with concrete arches; the current was too swift, the floods were too great, the drift too heavy (frequently full sized redwood trees, some as great as fifteen feet in diameter, are floated down the river with their roots dragging). The concrete arch spans, it was said, could not be built high enough or long enough to pass such drift; also, there was only an unstable sand and gravel bottom on which to build such mammoth arches. It was pointed out that nowhere in the world had such large concrete arches been successfully built on such foundation.

Memorial Features Determine Design.

The bridge department of the California Highway Commission was not daunted by such objections. The problem was approached by the bridge engineer and his assistants with the same conservative assumptions as

(Continued on page 14.)

KLAMATH 1

Thousands Attend Celebration

NEARLY 4000 people from northern California and southern Oregon gathered near Requa, Del Norte County, on May 17th, to join with the California Highway Commission in celebrating the virtual completion of the Klamath River bridge. Prominent among visiting officials were Governors Friend Wm. Richardson of California and Walter M. Pierce of Oregon.

Many former residents of the north coast counties came from distant parts of the state to view the realization of the dreams of years. Members of the California Press Association joined the automobile associations and civic organizations in participating in the event, which proved to be the greatest highway celebration in the history of the Redwood highway.

Toy Chairman of the Day.

Following a barbecue at noon and a band concert by the Arcata High School band the speaking program was held at the north approach to the bridge. Chairman Harvey M. Toy of the California commission presided as chairman of the day for the presentation of the following program:

Introduction of visiting officials and engineers.

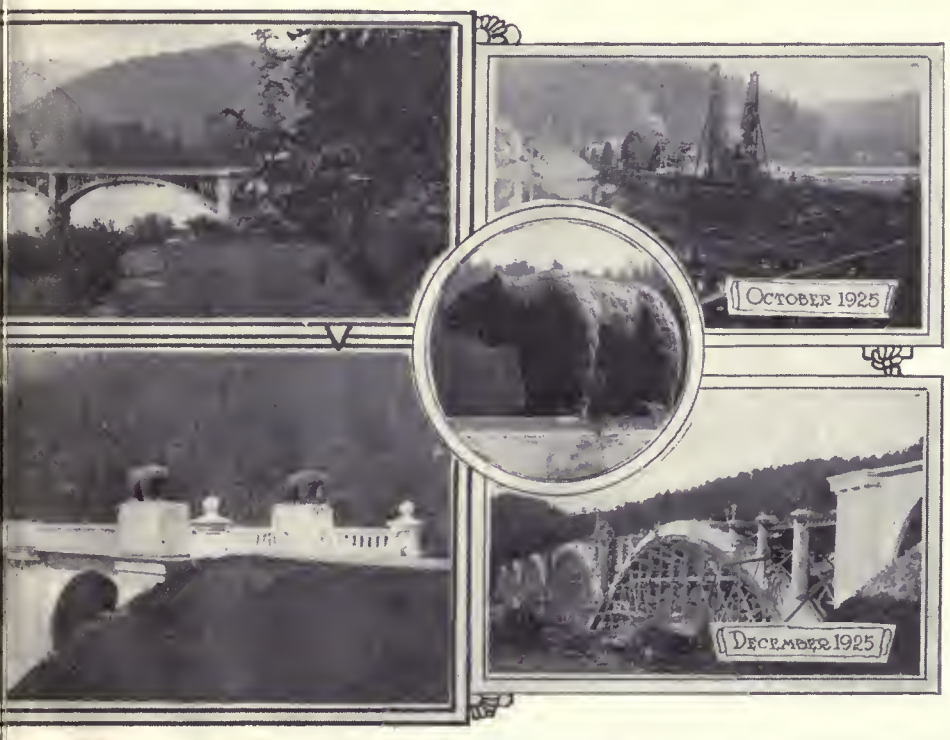
Program of addresses—A. D. Lee, Del Norte County; T. W. Hine, Humboldt County; Louis Everding, Highway Commissioner; R. M. Morton, State Highway Engineer; Frederick Meyer, President, Redwood Highway Association; Dr. L. I. Hewes, Deputy Chief Engineer, United States Bureau of Public Roads; Walter M. Pierce, Governor of Oregon.

Address of the Day—Friend Wm. Richardson, Governor of California.

Unveiling Memorial Tablet: Donald Douglas, son of the late Dr. Douglas.

Following the program, the festivities were continued during the afternoon and evening with music and dancing on the bridge. The structure was beautifully decorated for the event with wild flowers gathered by school children from among the redwoods of Del Norte County.

ak Barrier on Redwood Highway and End Isolation of Del Norte County



ER BRIDGE.

Department Supplies Data About Structure

FACTS of interest in connection with the building of the Klamath River bridge:

AUTHORIZATION: Special act appropriating $225,000 approved by Governor Friend Wm. Richardson, May 25, 1923.

BIDS: Bids were asked by California Highway Commission April 28, 1924, and received May 26, 1924.

CONTRACT: Contract number 443 awarded by the commission June 19, 1924.

FEDERAL AID: California federal aid project number 116A.

CONSTRUCTION: Work commenced by contractor July, 1924.

COST: $400,000.

LENGTH: 1147 feet, consisting of five main arch spans each 210 feet long, with short approach spans at either end.

WIDTH OF ROADWAY: 21 feet clear between curbs.

HEIGHT OF ROADWAY ABOVE WATER SURFACE: 51 feet.

MATERIAL REQUIRED IN CONSTRUCTION: 9060 cubic yards concrete; 850,000 pounds of reinforcing steel; 946 foundation piles; 2,000,000 feet of sawed lumber. A fully equipped saw mill was built at the site of the bridge to furnish the lumber.

FOUNDATIONS: Foundations are 30 feet below low water surface, supported on heavy fir piles which are pointed with cast iron shoes.

CONTRACTOR: F. Rolandi, San Francisco, California. R. J. Kennedy, construction superintendent for the contractor.

COMMISSION: Harvey M. Toy, Chairman; Louis Everding, Nelson T. Edwards.

ENGINEERS: R. M. Morton, State Highway Engineer; Harlan D. Miller, Bridge Engineer.

RESIDENT ENGINEERS FOR THE COMMISSION: Stewart Mitchell, associate bridge engineer; D. C. Willett, associate bridge engineer; J. C. Wilson, resident engineer; H. Carter, resident engineer; J. F. Orr, assistant resident engineer.

BRONZE MEMORIAL TABLETS: These are placed on pylons at the four corners of the bridge setting forth the fact that the bridge is a memorial to Dr. G. H. Douglas. On each pylon there is a large figure of a grizzly bear, the bear being symbolical of the country in which the bridge is located.

WHAT KLAMATH BRIDGE MEANS TO ENGINEER

(From the address of State Highway Engineer R. M. Morton.)

WE OF the California Highway Commission rejoice today in the interest which is evidenced in the building of this great structure. Seldom occurs such opportunity for the works of the engineer and the constructor to be so forcibly impressed upon the minds of thoughtful and influential citizens.

No mere words can adequately impress upon you the conception of this work, from earliest detail of plans to final realization of the actual massive structure, as it is visualized in the minds of its engineers and its constructors. To the state's engineers, who have had a part in this magnificent accomplishment, the celebration here today has a twofold significance.

Into the structure have been incorporated those same qualities which characterized the man whose memorial it is. The qualities manifested by both of solidity and strength, usefulness of purpose, dignity, and beauty of outline are as necessary in good bridges as in good citizens.

To the state's engineers, the other significance of this celebration is in realization of the joy which comes only to him who creates and builds. Three short years ago the Klamaath River stretched unbridged for thirty miles inland, its banks unscarred by pick or shovel, a barrier effectively isolating a large section of California. This gorge was as forbidding to man's puny crawling efforts as any portion of the canyon which you now see by looking eastward. Even then the surveys had indicated to the creative mind of the engineer how obstacles could best be overcome, and the bridge was taking skeleton outline form on the drafting boards. Their conception dominated the minds of many men by day, and filled their dreams by night. Their plans now brought to fruition stand as their lasting contribution to the memory of Dr. Douglas and to the advancement of civilization.

A Dream of Years.

This moment of congratulations is not the important moment. We are thinking of the thousands of years during which this stream existed unconquered by man; of the fifteen years past during which to the highway engineers, the bridge has been a possibility; of the solution of each separate problem of the survey, design, and erection. Without the engineer and the constructor, achievements such as this would be impossible. Human existence would still be as in the cave man's day.

The urge of creative instinct to build for the betterment of mankind is as irresistible to the engineer and constructor as is the creative instinct of the painter or sculptor. This instinct draws men irresistibly to the building professions, thereby insuring the progress of civilization.

Visualize the creative ability, the mental ingenuity, the sweat of human industry, which have made this bridge a reality. Imagine the lonesomeness of men banished to work in this beautiful but isolated spot. The anxiety of families for their welfare. The grief for three who lost their lives during the construction. The temptations to the men themselves. The strain of sustained physical effort in menacing flood and weather. The tests of character in the maintaining of proper relations to each other, under trying conditions. These are the lot of the engineer and the constructor, which they accept, grumbling sometimes, but, nevertheless, in their hearts, glad of the opportunity to build.

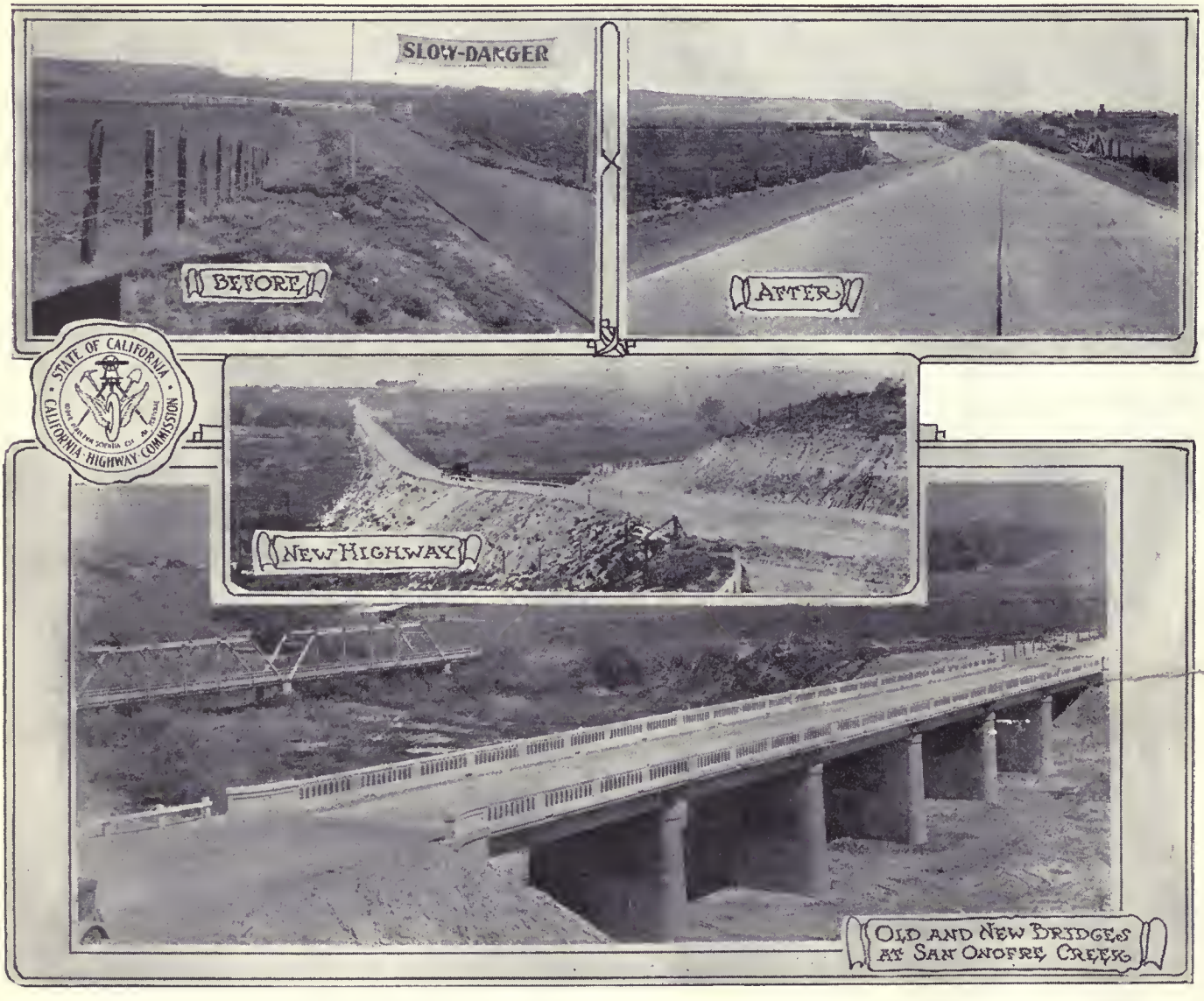
The Urge to Achieve.

The funds provided for this structure, the plans evolved in the minds of the designers, have drawn as with a magnet a group of men skilled in construction. These men have experienced the satisfaction of seeing develop from their work an object of usefulness and beauty, where two short years ago the obstacles seemed unconquerable. The assembling and arranging of equipment, the planning of the sequence of operations, the coping with unforeseen difficulties and even the humdrum monotony of ever rotating machinery, and oft repeated routine, form an enchantment and a reward in the completed whole. When the result is good, the reward has no equal in human experience.

To these men only—engineers and constructors—is possible the double appreciation of all which this gathering really celebrates. They have planned and built well. With the accomplishment of their purpose, their work here is done. The achievement of their brains and hands becomes an

(Continued on page 15.)

HANDSOME NEW BRIDGES FEATURE SOUTHERN LINE CHANGE



WHERE DEATH TRAPS WERE ELIMINATED—Views on the San Mateo-San Onofre line change on the Coast highway, San Diego County. The map on page four shows how dangerous curves and grades were eliminated and the distance shortened nearly a mile. The new highway runs straight across the San Mateo Creek flat. The old road can be seen winding off to the right. (Photos of highway by Division VII, bridges by Bridge Department.)

BOTH the bridge department and Division VII have much to be proud of as a result of the completion and opening to traffic of the San Mateo-San Onofre line change on the Coast highway in northern San Diego County. The handsome new reinforced concrete bridges across the two creeks and the straight alignment, eliminating sixteen curves and shortening the distance two-thirds of a mile, have evoked much deserved praise from the traveling public.

A part of the line change has been paved with concrete 20 feet wide. The remainder is a fill across the San Mateo Creek flat, which has been surfaced with crushed rock to permit settlement before paving is completed. It is being kept in excellent condition by constant maintenance under the direction of Division VII.

Replace Narrow Structures.

The two new bridges are also one of the features of the improvement much appreciated by users of the highway. They replace narrow wooden Pratt trusses built by the county years ago on the line of the old road, which was also graded by the county. The new structures are of similar design and construction, of the three-girder type 50-foot spans, with a clear roadway width of thirty feet. With three exceptions, where the formation made it unnecessary, they have Douglas fir pile foundations under the piers, the piles being drived to a penetration of forty feet.

The San Onofre Creek bridge has six spans resting on seven piers, the length being 300 feet. The approach fills were protected at the toe with reinforced slope paving, five inches thick. The hollow type of pier construction was adopted to reduce the dead load and as the more economical.

The San Mateo Creek bridge is similar, except that it has seven piers and one abutment and a total length of 400 feet. The abutment is of the reinforced type with counterforts. The south approach fill is protected with slope pavement.

Central Mixing Plan Used.

R. A. Wattson, the contractor on the San Mateo Creek bridge, supplied his concrete from a central mixing plant on the north bank. Harry Carter was resident engineer and was later succeeded by G. W. Thompson, assisted by L. DeCew. Thompson was also resident engineer on the San Onofre bridge which was built by the Fluor Construction Company.

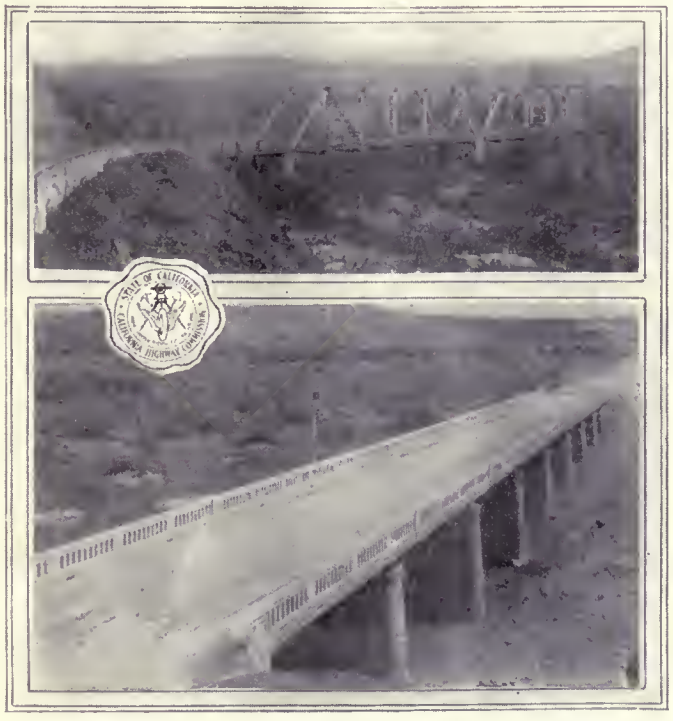
Finishing of the surface of both bridges was done with a Berg Concrete Surfacing Machine. After the bridge floors had been ground to the desired smoothness a cement grout was rubbed in with a float faced with a piece of carpet. Excellent results were obtained.

The grading and paving of this line change was financed with gasoline tax funds. San Diego County is refunding to the state the cost of the bridges, having voluntarily agreed to this cooperation in anticipation of the wonderful improvement to be brought about in the highway.

CORRECTING OUR MISTAKES

(From the Martinez Standard.)

THE MISTAKE that was made in the early days of road building in California—making the highways too narrow—is being corrected now at great expense. Highways are being widened in many places, to meet the demands of constantly increasing and badly congested traffic. In construction of new roads, ample allowance should be made for increased traffic, and the roads should be made wide—the wider the better. No danger of getting them too wide. The time is coming when every main thoroughfare in the state will have to be at least one hundred feet wide, or else there must be two fifty-foot highways paralleling each other, with one-way traffic. The phenomenal increase in the number of automotive vehicles in California foreshadows a period of traffic volume which roadways as they are today would not accommodate.



SAN MATEO CREEK BRIDGE—This beautiful reinforced concrete structure was an important part of the radical line change in northern San Diego County. The old bridge which has been replaced is shown above. (Photos by Bridge Department.)

RAPID HARDENING CEMENT SPEEDS COMPLETION OF NEW YOLO SUBWAY

THE PROBLEM of maintaining railroad traffic across a subway under construction on the state highway in Yolo County was satisfactorily solved recently by the bridge department by the use of rapid hardening cement concrete. The structure, which will permit the highway to pass under the tracks of the Woodland branch of the Sacramento Northern, consists of reinforced concrete abutments with a deck of structural steel I beams encased in concrete and covered with a concrete slab.

As soon as the abutments had attained the necessary strength, the steel girders were put in place and the track supported on wooden stringers, which in turn were supported by wooden blocks

YOLO UNDER PASS—Improvement at the western entrance to Sacramento under construction by the Bridge Department.

placed directly on the girders. Temporary piling on which the track had been supported was then removed.

The concrete portion of the deck was poured complete, except that openings were left around all track supports. After the deck had hardened the track was supported on the finished portions and the openings filled with a rapid hardening Lumnite cement concrete. Within thirty-six hours it was possible to remove all temporary supports from under the rails and to replace the ballast in its permanent condition.

Four aggregates were used in all concrete as follows:

Cement— 1 sack.
Sand—1.9 cubic feet.
Pea Gravel—1.4 cubic feet.
¾" Gravel—1.6 cubic feet.
1½" Gravel—1.0 cubic feet.
Water—48 to 52 pounds—which produced a slump of approximately 3 inches.

The rapid hardening concrete was placed in the afternoon and ponded before leaving it for the night, and on the second morning it was possible to place the ballast on the deck. Use of rapid hardening cement reduced the curing time from four weeks to less than two days. As the job was practically completed when the track supports were removed, use of ordinary cement would have meant considerable delay to the contractor before the ballast could have been replaced.

C. M. Butts was resident engineer for the bridge department.

URGES CLEAN UP.

During August, Susanville, Lassen County, will entertain the state convention of the American Legion. In preparation for the event, Maintenance Superintendent E. J. Gribble, of Division II, is doing all he can to have the roads in the vicinity in the best possible condition.

Gribble also has issued an appeal to the people of the community to assist him in cleaning up the roadsides by refraining from dumping cans and rubbish on the highways. He will appreciate the cooperation of the people of Westwood and Susanville.

WHAT THE DIVISIONS ARE DOING

DIVISION II.

HEADQUARTERS, REDDING.

H. S. COMLY, DIVISION ENGINEER.

Counties of Siskiyou, Modoc, Trinity, Shasta, Lassen, Tehama, and northern Plumas.

WORK is again under way in the Sacramento canyon, the George C. Pollock Company having commenced operations on its grading contract for the Dog Creek-La Moine section of 4.5 miles. Several radical line changes will be made, particularly at La Moine where considerable distance will be saved.

Bids have been asked on two other Division II projects—grading in Lassen County and a surfacing job east of Alturas.

The Halfway Creek-Dog Creek contract of the Nevada Contracting Company has been completed and accepted, making available ten miles of additional safe and fast highway in the Sacramento canyon.

Division II maintenance crews are now preparing for the period of heavy summer traffic. Particularly is this true of the county roads on state highway routes taken over for maintenance on January 1st. Considerable progress has been made and favorable comment has been received regarding the condition of the Trinity and Modoc laterals.

The Charley Creek bridge, constructed by Bordwell and Zimmerman under the direction of the bridge department, has been completed and its beauty of design is attracting much attention. It crosses a deep ravine on the Sacramento canyon section saving considerable distance and eliminating many curves.

DIVISION III.

HEADQUARTERS, SACRAMENTO.

F. W. HASELWOOD, DIVISION ENGINEER.

Counties of Butte, Colusa, El Dorado, Glenn, Nevada, Placer, southern Plumas, Sierra, Sutter, Yuba, and northern Sacramento and Yolo.

GRADING of the Truckee River highway has been completed and a splendid water grade road is now ready for traffic from Truckee to the Nevada line, eliminating for all time the notorious Dog Valley grade. In its place has been substituted a pleasant and safe highway along the beautiful Truckee River. The celebration of the opening of the new road will take place at the California-Nevada line on June 10th.

Work has started on the placing of 5400 cubic yards of surfacing on the Donner Lake-Truckee section of the Victory highway.

A division contract has been awarded to Hemstreet and Bell for the placing of 8000 cubic yards of surfacing on the Gold Run-Emigrant Gap section east of Colfax.

C. R. Merrill is moving 21,000 cubic yards of material excavated from a drainage ditch in Glenn County and is placing it among the shoulders of the highway for a distance of nearly three miles south of Willows.

Tahoe Work Starting.

Construction has been begun on road improvements around Lake Tahoe between Emerald Bay and Tahoe City in Placer and El Dorado counties. A high standard road on new alignment is being constructed by state forces.

Echo summit was opened to traffic this year on April 14th; Donner summit on April 22d; and the Yuba Pass route at about the same time.

An extensive program of widening and reshaping of the roadbed between Placerville and Camino has been completed.

Through Camino, El Dorado County, 4000 lineal feet of 2" by 12" curbing has been placed and the shoulders surfaced with crushed rock.

Considerable rock shoulder work has been done on the Westside highway in Yolo and Glenn counties.

DIVISION IV.

HEADQUARTERS, SAN FRANCISCO.

JOHN H. SKEGGS, DIVISION ENGINEER.

Counties of San Francisco, Marin, Sonoma, Napa, Contra Costa, Alameda, Santa Clara, Santa Cruz, and San Mateo.

EQUIPMENT has been moved in and construction is starting on the improvement on a mile between Vineburg Junction and the Napa County line, Division IV. Improvement of this short section will provide a paved highway connecting the Napa and Sonoma valleys. W. H. Hauser of Oakland has the contract for placing a bituminous macadam surface, after grading and reshaping the existing roadway.

Two power shovels are operated in Division IV on slide removal on the Pacheco Pass highway and on the Skyline boulevard.

Rapid progress is being made by contractor J. B. Galbraith on the placing of second-story concrete pavement, 20 feet wide, from a mile north of Mark West Creek to Santa Rosa. Galbraith hopes to complete his contract early in the summer before the peak of traffic is reached.

Concrete shoulders for the widening of the highway to 20 feet have been completed from Healdsburg to the Russian River.

DIVISION V.

HEADQUARTERS, SAN LUIS OBISPO.

Counties of San Benito, Monterey, San Luis Obispo, and Santa Barbara.

L. H. GIBSON, DIVISION ENGINEER.

DIVISION V, generally a section where fair weather prevails, did not escape the recent severe storms which did much damage to highways in many parts of the state. Heavy floods occurred in southern Santa Barbara County, where a rainfall of five inches in as many hours was reported. Mud was washed upon the pavement in several places, impeding traffic until it could be removed by maintenance crews.

A cloudburst in the upper Cuyama Valley did damage to construction work on Route 57, the Cuyama lateral. A pile bridge was swept away by the flood, a large trestle damaged, and roadbed under construction washed away.

A party has begun the recently ordered survey of the proposed new line between Salinas and San Juan for the elimination of the San Juan grade. The new line will run to the west of the present location and the data gathered will determine the practicability of the proposed change.

The survey was ordered by the commission at the request of the Supervisors of Monterey County.

DIVISION VI.

HEADQUARTERS, FRESNO.

E. E. WALLACE, ACTING DIVISION ENGINEER.

Counties of Fresno, Madera, Merced, Mariposa, Kings, Tulare, and Kern, north of the Tehachapi.

THE Merced canyon highway providing an all-year-around entrance to Yosemite National Park will be opened to public travel on July 31st. This date has been set by the commission for the official opening and plans are under way for a great celebration of the event, which is expected to draw visitors from all parts of the state. A force of 250 prisoners, nearly 100 free men, and five power shovels and other equipment is now rushing the grading and surfacing to completion.

Work is starting on two reconstruction projects on the trunk line through the San Joaquin Valley from Madera to Borden and from Delano to the Kern County line. The highway in each instance is being widened to 20 feet and thickened.

Contractors for Fresno County are completing the grading of a section of the Coalinga lateral which will be taken over by the

commission as soon as the work is accepted by the county. This is a section of the Sierra to the Sea highway.

Additional widening and straightening work is being done on the Sequoia Park entrance in the vicinity of Three Rivers, Tulare County. A power shovel is being used to complete the work in advance of heavy summer traffic.

Maintenance Activities.

Recent unprecedented rains and cloud bursts have imposed extra duties upon maintenance crews of Division VI. In the vicinity of Bakersfield the pavement was flooded to a depth of several feet and the adjoining embankment of the Southern Pacific Railroad was washed out in places. The unprecedented character of the flood is demonstrated by the lack of sufficient culverts under the Southern Pacific tracks, despite the fact that the railroad has been completed through the valley for many years.

Division VI, in cooperation with Division IV, is oiling several miles of rock-surfaced highway on the Pacheco Pass route.

Puncture vine control is receiving considerable attention from the maintenance department of the division. The highway forces are endeavoring to coordinate the work of the several county horticultural commissioners of the valley. Several interesting experiments are being made with various solutions of distillate, used as a spray in an effort to stop the spread of the pest.

DIVISION VII.

HEADQUARTERS, LOS ANGELES.

S. V. CORTELYOU, DIVISION ENGINEER.

Counties of Los Angeles, Ventura, Orange, San Diego, and eastern Kern, south of Mojave.

TWO miles of 20-foot concrete pavement have been completed and opened to traffic on the new Coast highway through the Malibu Ranch. April rain storms stopped paving operations, but this work is again under way.

On the new Coast highway in Orange County south of Laguna grading has been completed from San Juan Creek near Serra to Aliso Creek, a distance of 5½ miles.

Work is now well under way on the important line change of seven-tenths of a mile long at Chalk Hill on the Ventura boulevard in Los Angeles County. Several dangerous curves will be eliminated and the grade reduced. The new section of highway when graded will be paved with a 24-foot oil macadam.

Additional Slides.

Another slide of approximately 21,000 cubic yards has occurred on the Coast highway in Ventura County, necessitating the addition of a second power shovel and several dump trucks to the equipment of the maintenance crew at work on this section.

On the Jahn and Bressi contract along the coast in San Diego County, the "second-story" 20-foot concrete pavement has been completed and opened to traffic from Las Flores underpass to the north end of the contract near San Onofre, a distance of about 8 miles. A center traffic guide line has been painted along this entire stretch of new highway.

Grading in connection with the improving of the alignment on Mountain Springs grade on the Borderline highway in San Diego and Imperial counties has been completed.

Maintenance Crews Show Worth.

Maintenance forces worked day and night in many parts of Division VII during the recent period of heavy rains caring for traffic and those who were shut off from the highway by washouts. Teams were used to pull cars through the mud on Coast highway near the Ventura causeways. Considerable debris was washed up to the highway by the storm and had to be cleared away to restore normal traffic conditions.

Sections of the Arroyo Seco highway in the Angels National Forest were completely washed away by cloudbursts. Maintenance crews rigged up cable crossings as a means of communication with resorts in the canyon. Emergency foot-bridges were installed in some places.

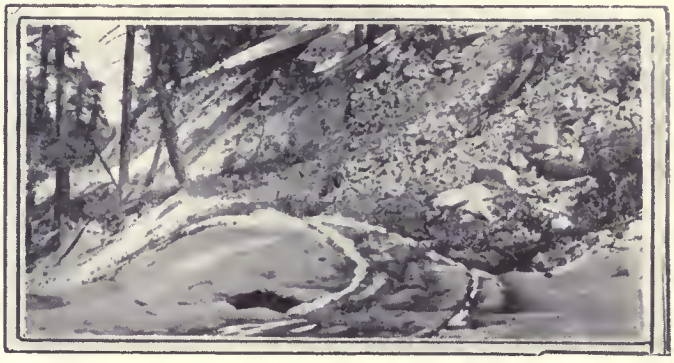
DIVISION VIII.

HEADQUARTERS, SAN BERNARDINO.

E. Q. SULLIVAN, DIVISION ENGINEER.

Counties of San Bernardino, Riverside, and Imperial.

PAVING of the six-mile section across the Sand Hills, Imperial County, on the interstate connection with Arizona, is now under way. Placing of an asphalt concrete pavement, 20 feet wide, was begun at the eastern end of the section and will be continued westward. More than two miles of grading have been completed,



ON THE CREST ROUTE—A typical slide on the state highway in the San Bernardino Mountains where Division VIII is being forced to make large expenditures of maintenance funds because of heavy storms during recent weeks.

involving the moving of 150,000 cubic yards of sand. Two large drag-line outfits are being used by the contractors.

Absence of usual wind storms and much rain have facilitated the movement of the sand for the making of the embankment upon which the pavement is being placed. The sand has proved easy to handle when moist.

Shoulders to be Oiled.

A production plant for the screening of gravel has been set up near Yuma, where the contractor's asphalt plant is located. Eighteen light trucks will be used on the project and as fast as the pavement is completed the shoulders and slopes of the high sand embankment will be oiled to prevent erosion by wind storms.

Heavy rains have caused the worst slides in the history of the division on the Crest route in the San Bernardino Mountains. It is estimated that 35,000 cubic yards of material must be moved to completely clear the road. J. I. Boaz is in charge of the shovel crew at work on this route.

DIVISION X.

HEADQUARTERS, SACRAMENTO.

R. E. PIERCE, ACTING DIVISION ENGINEER.

Counties of Amador, Calaveras, Alpine, Tuolumne, Stanislaus, San Joaquin, Solano, and southern Sacramento and Yolo counties.

RECONSTRUCTION of the San Joaquin Valley trunk highway between Modesto and the northern boundary of Stanislaus County has been begun by the Valley Paving Company of Modesto. The highway is being widened to 20 feet by the addition of cement concrete shoulders. It will be thickened with an asphalt concrete surfacing.

The sand fill for the new approach to the M street bridge in West Sacramento, Yolo County, is practically completed and bids for the placing of a pavement will be asked in the immediate future.

All grading and paving work on the state's part of the Stockton boulevard improvement at the southern entrance to Sacramento has been completed and opened to traffic.

Line Changes Planned.

Plans for two proposed line changes, one near Arno, Sacramento County, and a second near Vacaville, Solano County, each eliminating many curves and considerable distance, have been completed and submitted to headquarters. The commission has agreed in each instance to do the grading and surfacing during 1927, provided the counties will secure necessary rights of way.

Extensive improvements have been completed on the Big Oak Flat entrance to Yosemite National Park under the direction of Foreman W. H. Martin. The grade at each side of Big Creek has been widened and straightened. Rock walls in the vicinity of South Fork carried away by winter slides have been replaced. Bad curves have been eliminated near Carl Inn.

HISTORY OF THE KLAMATH RIVER BRIDGE PROJECT

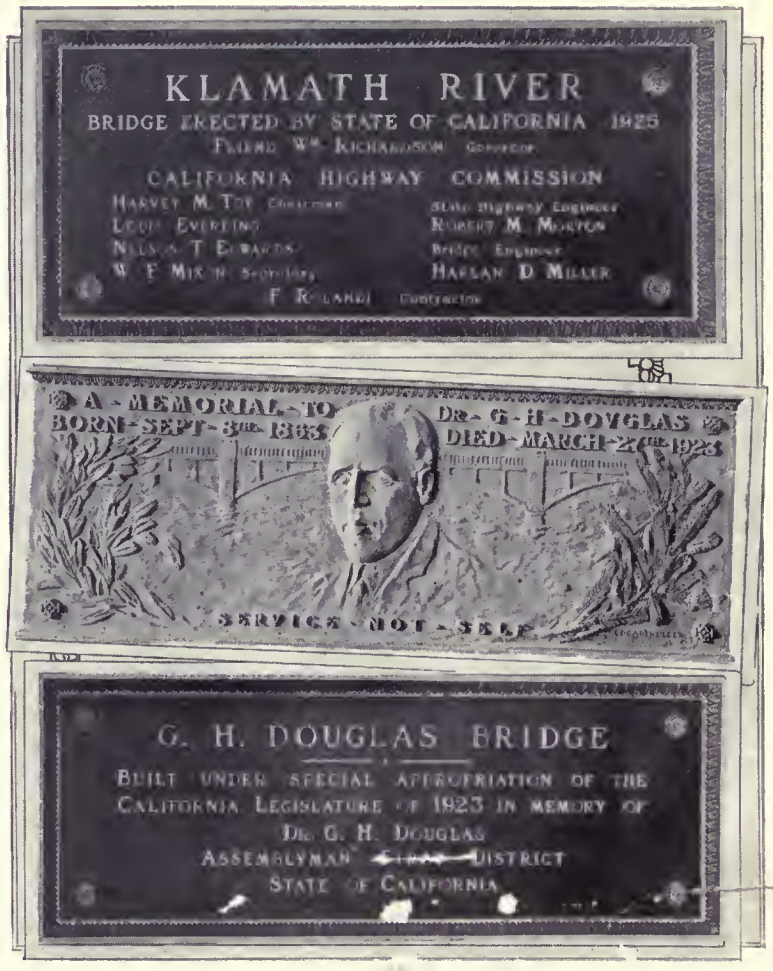
(Continued from page 8.)

have for the past fourteen years insured the stability of structures built under the direction of the commission. Comparative cost estimates of a steel structure and various combinations of concrete structures were made, the memorial features of the structure always being borne in mind. Final decision was made on a bold design of massive concrete arches founded on deep piles, surrounded and protected by cofferdams driven to refusal in the sand and gravel at the bottom of the river.

Carefully checked measurements were constantly under way during construction, and the centers were struck in the false work without apparent settlement of the arches. The bridge will stand for all time as a suitable and beautiful memorial to Dr. Douglas.

Throughout two winters, while under construction, this bridge has withstood floods, as great as ever have come upon this river, with absolutely no damage. The most delicate of engineering instruments have not detected any settlement, either of the arches or the foundation. Each pier of the bridge rests upon 150 piles, each pile hammered to refusal under repeated heavy blows. The piers are as firm as though built upon solid rock. This is an unusual record for foundations on bridges of this type. Even the designers expected some settlement when the heavy arches first carried the load for which they were designed.

The completion of the Klamath bridge will close one of the few remaining gaps in the Coast state highway between San Francisco and Portland, Oregon. It will also open to the motorists of California and the nation a vacation land of virgin woods and mighty streams, the like of which is to be found nowhere else. To some it is a region for care-free outdoor sport, to others a land of dreams, a place for solemn communion with the ever-living redwoods of a forest primeval whose mysteries of life go back beyond the time of civilizations now gone from the earth. Whatever appeal this north coast section of California may make, it is one of unequaled boldness and beauty, unsurpassed in any section of the West.


KLAMATH RIVER
BRIDGE ERECTED BY STATE OF CALIFORNIA 1925
CALIFORNIA HIGHWAY COMMISSION
HARVEY M. TOY
LOUIS EVERDING
NILES T EDWARDS
W F MIXON
ROBERT M. MORTON
HARLAN D MILLER
A - MEMORIAL - TO
BORN - SEPT - 3RD 1863
DR. G. H. DOUGLAS
DIED - MARCH - 26TH 1923
SERVICE - NOT - SELF
G. H. DOUGLAS BRIDGE
BUILT UNDER SPECIAL APPROPRIATION OF THE
CALIFORNIA LEGISLATURE OF 1923 IN MEMORY OF
DR. G. H. DOUGLAS
ASSEMBLYMAN DISTRICT
STATE OF CALIFORNIA

Six plaques in all have been placed on the pylons at the approaches to the Klamath River bridge—two of each of the above. The sculptural work on the Douglas Memorial Tablet (center above) was done by Edgar Keller, California sculptor, a native of Del Norte County.

Jim: "Now that you're back from your motor trip what do you intend to do?"

Bill: "Devote the rest of my life to the promotion of good roads."—*Selected.*

SAVINGS ON RURAL DELIVERY PAY FOR FEDERAL AID

"IT IS a matter of record that increased services at lower cost in rural mail and parcels post has already made savings which go far toward paying the interest on every dollar of federal aid spent for highway construction."

This is one of the answers given the critics of federal aid by A. M. Loomis of the Washington office of the National Grange, also a member of the Advisory Board of the District of Columbia Division of the American Automobile Association.

With the introduction of rural delivery mail service, the use of the highways by the government was greatly increased, Mr. Loomis points out, while every mile of surfaced road means longer delivery routes and a larger number of people served.

The federal government is now using 1,205,572 miles of highway every day for this service. While it has so far assisted the states in improving approximately 200,000 miles. In the use of this road mileage by the government, 30,060,816 individuals are being served and there are still 14,000,000 persons to be added as the service is extended.

Extract From an Accident Report.

EXTENT OF INJURY—Small gash in head, cut by falling rock.
STATEMENT OF INJURED—"Holy Smoke!"

(How things have changed since the time when highways were built almost entirely by mules and mule-skinners.)

"THAT'S WHAT CAESAR DID"

When Caesar took a westward ride
And grabbed the Gauls for Rome,
What was the first thing that he did
To make them feel at home?
Did he increase the people's loads,
And liberty forbid?
No! he dug in and built good roads—
That's what old Caesar did.

He built good roads from hill to hill,
Good roads from vale to vale,
He ran a good-roads movement
Till Rome got all the kale;
He told the folks to buy at home,
Built roads their ruts to rid,
Until all roads led up to Rome—
That's what old Caesar did.

If any town would make itself
The center of the map,
Where folks will come and settle down
And live in plenty's lap;
If any town its own abodes
Of poverty would rid,
Let it go out and build good roads—
Just as old Caesar did.

—From Kansas City *Journal-Post.*

HIGHWAY NEWS NOTES

H. W. SCREIBER has resigned as maintenance engineer in Division IV to accept a position with the Granite Construction Company of Watsonville. He has held various positions with the department over a period of nearly seven years during which time he has had several promotions.

E. L. Stump is again in charge of maintenance in the Red Bluff district, Division II, after a leave of absence of six months. R. E. Ward in charge during his absence has been made chief of party in the Sacramento canyon.

E. J. Bassett will act as resident engineer on the Dog Creek-La Moine grading contract in the Sacramento canyon. A. A. Bigelow and R. F. Reynolds will be assistants.

J. A. Casson, maintenance superintendent at Hayward, Division IV, has resigned to enter the contracting firm of Hauser and Casson. He will be succeeded by A. S. Moore, formerly foreman on the Peninsula highway.

R. W. Brown Resigns.

OFFICIALS of the convict department and free men connected with the Folsom Prison camp recently presented Superintendent Ralph W. Brown with a handsome gold watch and chain upon the occasion of his resignation. Mrs. Brown was remembered with a wrist watch. Brown has accepted a position with the George C. Pollock Company and will be in charge of the Dog Creek-La Moine grading contract in the Sacramento canyon. Brown has been a prison camp superintendent since the establishment of some of the first camps in 1916.

N. D. Douglas, Division V draftsman, has resigned to accept a position on an irrigation survey near McKittrick.

O. B. Brinkerhoff, formerly assistant resident engineer on the Hicks to Daggett grading contract, Division VIII, is now with the Southern Sierras Power Company.

C. A. Potter, formerly with Division I, is now resident engineer on the paving project in northern Stanislaus County, Division X.

C. W. Springer, former resident engineer with Division X, has resigned to accept a position with J. F. Knapp, contractor.

J. D. Greene, formerly with the Nevada Highway Department, is assistant resident engineer on the Stanislaus project.

Caruthers With Division IX.

Announcement is made of the appointment of W. S. Caruthers as assistant division engineer with Division IX, headquarters Bishop.

WORTH CELEBRATING

(From the Reno (Nev.) Gazette.)

THE PLAN of the California Highway Commission to open the Truckee River highway with formal exercises will meet with a favorable response in western Nevada, and there is every prospect that this state, or at least Washoe County, will join with the Californians in observing the event.

For more than seventy miles this magnificent road follows the course of the Truckee River, without including the Lake Tahoe byroad, which adds another fourteen miles. For three-fourths of the distance it is situated in the river's canyon, which it does not finally leave, after it is encountered at Truckee, until the open country is reached at Wadsworth. Almost fifty miles of the route is located within the state of Nevada, which, like California, is prosecuting its completion with all possible speed. The California end will be completed first, but already the Nevada section is practically finished from Reno to the California line and probably will be open when California holds her exercises. One year later the route will be in use for its entire length.

A Splendid Gateway.

The adoption of the river route for the mountain section between Truckee and the Nevada line was essentially a Nevada plan. Its preeminent scenic value was repeatedly presented to the California commission by interested persons in Reno and vicinity but without effect until Friend Wm. Richardson became governor and Harvey M. Toy became the chairman of the highway commission of that state. They were quick to see its advantages as a splendid gateway to California and for that reason and to please the citizens of a sister state it was adopted. Its cost will exceed, perhaps, the Dog Valley route approved by the old California Commission, but the difference is offset many times over by the other advantages secured.

It will be truly a magnificent road. It is worth celebrating.

EFFORTS OF MAINTENANCE CREW PRAISED BY SONOMA PAPER

A HANDSOME new reinforced concrete bridge across Willow Brook on the Redwood highway in Sonoma County was recently completed under the direction of the bridge department. The efforts of the Division IV maintenance crew under superintendent R. P. Duffy and Foreman Carl Lauritzen to properly handle traffic during the period of construction and recent stormy weather is commented upon by the Petaluma *Argus* as follows:

> Too much praise can not be given Mr. Duffy and his men for their work while the bridge was being built. Several times during the winter the temporary bridge was several feet under water, while the road was under water that was as high as the top of the fences.
>
> On both sides of the road leading from the bridge site to Rainsville, there are wide and deep ditches and the highway force marked the roadway with red flags, every time the water was high, guarded the temporary bridge, kept men on hand to direct strangers to the detour over the hill road when that course was necessary, and kept powerful motor trucks on hand to tow stranded cars through the high water to safety.
>
> **On the Job.**
>
> These men were on the job day and night and were always right at hand and never missed a point. To make matters still better, it is a most courteous and accommodating bunch of men, but they could not be anything else and work with their popular head, Mr. Duffy.
>
> The *Argus* has watched with interest the manner in which these workers handled things; how they patrol the highways and quickly remove obstructions and remedy breaks and repair damage and the *Argus* is ready to wager than in all of the great highway system of the State of California, there is not a more efficient, popular, accommodating or interested maintenance crew. And they are extremely popular citizens, looking out for the interests of the state as well as of the people who use the portion of the highway under their care and control. The *Argus* delights in saying nice things of people who actually deserve praise and these splendid men surely do deserve all the good things that can be said of them. And in the whole district, nobody is happier over the completion of the bridge and the restoration of traffic over it, than are they.
>
> The bridge which was destroyed was built by the county while the elegant new bridge was built by the State Highway Commission.

WHAT THE KLAMATH RIVER BRIDGE MEANS TO ENGINEER

(Continued from page 9.)

easily accepted and quickly forgotten part of your daily life. Urged by the instincts of creative art within them, they move restlessly to other fields, looking for more difficult tasks, where even greater ingenuity, industry and effort are required.

Hail the engineers and the constructors.

GARDENER COMMENDED.

Secretary W. F. Mixon and Commissioner Louis Everding returned recently from a trip over the Redwood highway enthusiastic over the lawns and flower beds surrounding the division office at Willits. F. H. Taylor, the gardener in charge, was given high praise by the visiting officials for the work he is doing, which is making the state property one of the attractive spots along the highway.

STATE HIGHWAY FUND CONTRACTS (Bond Funds, Including Federal Aid)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE APRIL 5, 1926.						
482	VII, VIII	San Diego-Imperial	12	H-A	Top of Mountain Springs Grade to Myers Creek Bridge	1.90	Grading	A. R. McGrath	$74,250 00	Sept. 21, 1925	------
488	VIII	Riverside	64	C	Desert Center to 4 miles west of Hopkins well	21.00	Grading	F. C. Psyton	31,207 50	Nov. 30, 1925	------
					AWARDED SINCE APRIL 23, 1926.						
497	1	Del Norte	1	C	Across Smith River, about 1 mile west of Adams Station	-------	Reinf. Concrete Arch Bridge	Smith Brothers Co.	$44,183 36	May 7, 1926	175
498	VIII	Imperial	26, 27	G-C, D	Brawley Main Canal, Alamo River and Lowline Canal	-------	Three Timber Bridges	W. M. Ledbetter & Co.	20,836 13	May 7, 1926	125
499	III	Placer	3	A	Across Auburn Ravine at Lincoln	-------	Reinf. Concrete Girder Bridge	Holdener Construction Co.	17,618 18	May 15, 1926	125
					Sub-total	-------			$82,637 67		
					PENDING AWARD—None.						
					Total State Highway Fund Contracts Awarded and Pending Award	-------			$82,637 67		

NOTE.—Primary construction covered by the above contracts does not include funds obligated on cooperative forest highway projects, prison camp road activities, or day labor jobs not being done under contract.

STATE HIGHWAY MAINTENANCE FUND CONTRACTS (Including Gasoline Tax Fund)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE APRIL 5, 1926.						
M-95	II	Shasta	3	C	Across Charley Creek	-------	Reinf. Concrete Arch Bridge	Bordwell and Zimmerman	$80,741 76	July 29, 1925	------
M-102	IV	Sonoma	1	C	Across Willow Brook	-------	Reinf. Concrete Girder Bridge	Lozier and Carr	20,247 19	Oct. 9, 1925	------
M-108	IX	Kern-Inyo	23	D, E-G	Ricardo to Five Mile Canyon	36.70	Grading	Harry Wilson	21,332 81	Nov. 30, 1925	------
					AWARDED SINCE APRIL 23, 1926.						
M-122	V	Santa Barbara	2	K	Between Santa Barbara and Goleta	5.11	P.C.C. Widening and A.C. Surfacing	Cornwall Construction Co.	$159,569 25	May 7, 1926	175
M-123	VI	Kern	4	F	Between 1 mile S. of Delano and the northerly boundary	2.77	A.C. Pavement Widening and Surf.	Warren Construction Co.	55,776 38	May 7, 1926	90
M-124	V	San Benito	22	A	Between San Juan Bautista and Hollister	6.90	P.C.C. Widening and Bit. Mac. Surf.	Granite Construction Co.	155,145 60	May 7, 1926	200
M-125	V	Monterey	2	H	Between San Ardo and Bradley	-------	1 R.C. Culvert and 2 R.C. Bridges	Granite Construction Co.	95,492 81	May 7, 1926	200
M-126	VIII	Riverside	26	D	Between Whitewater River and Edom	17.30	P.C. Concrete Widening	Matich Brothers	121,944 38	May 15, 1926	150
M-127	III	El Dorado	11	F	Between 2 miles E. of Sportsman's Hall and Riverton	8.56	Grading and Standard Surfacing	Irey and Holden	59,933 59	May 15, 1926	125
					Sub-total	40.64			$647,862 01		
					PENDING AWARD—None.						
					Total State Highway Maintenance Fund Contracts Awarded and Pending Award	40.64			$647,862 01		

NOTE.—The above obligations charged against the State Highway Maintenance Funds do not include funds from these sources obligated for general maintenance and for specific betterments being done under day labor authorization.

Seattle Public Library

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CALIFORNIA HIGHWAYS

A BULLETIN ISSUED BY THE CALIFORNIA HIGHWAY COMMISSION FOR THE INFORMATION OF ITS EMPLOYEES AND THE PUBLIC

Vol. 3 JUNE, 1926 No. 6

IN THE TRUCKEE CANYON—Scenes on the Truckee River highway, California's latest interstate connection with Nevada and the East, opened to traffic this month after being under construction for two and a half years. *Above*, Highway, river, railroad, in Truckee canyon; *Lower left*, Boca arch, concrete span over Truckee River near Boca; *Lower right*, Rock retaining wall overlooking canyon protects parking space for motorists. Photos taken prior to opening of highway to traffic on June 10th. See article on page three.

In this issue: TRUCKEE RIVER HIGHWAY DEDICATED—WHITTIER BOULEVARD COMPLETED

CALIFORNIA HIGHWAYS

HARVEY M. TOY, Chairman;

N. T. EDWARDS and LOUIS EVERDING, Commissioners.

ROBERT M. MORTON, State Highway Engineer.

W. F. MIXON, Secretary.

We are pleased to permit publication of any of the matter contained herein or to loan cuts, and this privilege is extended newspapers and periodicals without restrictions.

FRANK B. DURKEE - - - Editor

P. O. Box 1103, Sacramento, California.

Vol. 3 JUNE 1926. No. 6

CALIFORNIA HIGHWAY DEPARTMENT

FRIEND WM. RICHARDSON, Governor.

CALIFORNIA HIGHWAY COMMISSION

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N. T. EDWARDS, Commissioner, Orange

LOUIS EVERDING, Commissioner, Arcata

R. M. MORTON, State Highway Engineer, Sacramento

PAUL F. FRATESSA, Attorney, San Francisco

W. F. MIXON, Secretary, Woodland

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FRED J. GRUMM, Engineer of Surveys and Plans

HARLAN D. MILLER, Bridge Engineer

C. S. POPE, Construction Engineer

R. H. STALNAKER, Equipment Engineer

G. R. WINSLOW, Maintenance Engineer

C. L. McKESSON, Materials and Research Engineer

BEN H. MILLIKEN, Superintendent of Prison Road Camps

HERMAN B. WEAVER, Chief Accountant

LOWELL R. SMITH, Purchasing Agent

DIVISION ENGINEERS

T. A. BEDFORD, Division I, Willits

H. S. COMLY, Division II, Redding

F. W. HASELWOOD, Division III, Sacramento

J. H. SKEGGS, Division IV, San Francisco

L. H. GIBSON, Division V, San Luis Obispo

E. E. WALLACE (Acting), Division VI, Fresno

S. V. CORTELYOU, Division VII, Los Angeles

E. Q. SULLIVAN, Division VIII, San Bernardino

F. G. SOMNER, Division IX, Bishop

R. E. PIERCE (Acting), Division X, Sacramento

General Headquarters, Fifth Floor, Forum Bldg., Sacramento

DURING the early part of 1926, promotional examinations were held to give engineers in lower grades opportunity to qualify in the grades next above. Insofar as engineering grades V and VI were concerned, the results were a disappointment.

As the experience of the young engineer broadens with increasing years and responsibility, it is to be expected that, if he is sincere in his efforts, he will advance in the state's service. If advancement comes slower than his ambition grows, before criticising those who are responsible for passing upon his qualifications in competitive examinations, he should analyze whether he himself is making the most of his present opportunities.

From the engineering grades V and VI are selected the men who direct the work of large units of the organization. To be successful in administrative positions, a man must have abilities along the lines of organization, and some of the qualifications of a successful manager. For this ability to be useful, he must have a knowledge of the aims, policies, and methods of his superiors.

In the oral examinations above referred to, most of the applicants exhibited a lack of conception of the economic features of highway financing, planning, and construction. It appeared to the examining board that many of the men applying for the higher grades (to enter which by promotional examination requires a mark of 85 per cent) had never given a thought to the underlying engineering and economic reasons governing highway

(Continued on page 4.)

EVERY employee of the highway commission has a direct interest in the improvement of the highway organization's methods and results, both engineering and clerical, office and field. To that end, the State Highway Engineer invites constructive criticism or suggestions from every employee.

Ideas as to the more economical and efficient handling of your job, or suggestions for elimination of waste will be welcomed. Criticism is also desired from persons outside the organization, who are in a position to give facts.

Send only signed communications addressed as follows: California Highways, P. O. Box 1103, Sacramento, Cal.

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JUNE 1926

California Highways

VOL. 3 No. 6

Truckee River Highway Dedicated to Memory of Pioneers

ACCLAIMED as a notable accomplishment in road building, the Truckee River interstate highway, connecting California and Nevada and providing a new gateway to the east over the route of the pioneer Overland Trail, has been completed and opened to traffic. The joyful event was fittingly celebrated at the state line on June 10th with dedication ceremonies participated in by the governors of the two states, highway officials, and citizens.

Opening of this long-heralded and scenic route provides practically a water grade from Reno, Nevada to Donner Lake, California, which may be kept free from snow whenever the Donner Summit can be opened to traffic. The Dog Valley grade and the less discussed but more objectionable Dog Valley summit of 6500 feet elevation have been eliminated from the highway system of California.

The Truckee River highway stands as a monument to a valiant band of western road enthusiasts, who never gave up in their efforts for a water grade highway as an eastern entrance to California. Not the least of these is Chairman Harvey M. Toy of the California Highway Commission, who, as the first president of the Utah-Nevada-California Highway Association, was an advocate of the route long before his appointment to the commission. The association was sponsor of the Victory highway to which the Truckee canyon unit is California's most important contribution.

Governor Dedicates Highway.

As pointed out by Governor Friend Wm. Richardson in his address at the dedication ceremonies, the Truckee River highway is one of the major projects authorized and completed by the present highway commission. It was undertaken in accordance with the policy of the administration to concentrate funds on interstate connections and trunk highways. The Governor spoke, in part, as follows:

"As Governor, I am proud of the record the highway department has made during the past three and a half years. In addition of other important work, nearly 300 miles of new highway have been completed on the state's six major interstate connections at an expenditure of nearly $8,000,000. Many more miles have been improved by maintenance.

Today, you have viewed what has been done in this beautiful canyon to complete this gateway to the East. Three grading contracts and five bridge contracts, representing an expenditure of over $900,000, have forever eliminated the Dog Valley summit.

Other states are striving in the face of many difficulties to improve this great transcontinental highway. And California would have been unfair, would have failed in her duty to Nevada and Utah, had we declined to build our highway through the Truckee Canyon. We have kept our promise, the interstate connections are being finished.

In the name of the pioneers who suffered and struggled through these mountains to found a new American commonwealth, I dedicate the Truckee River highway to the service of The People."

The Work of Engineers.

When the present commission took office the Truckee River project was one of the first to receive consideration. State Highway Engineer R. M. Morton investigated the proposed location and reported favorably upon its feasibility, following which, the commission, early in 1923, authorized location surveys, the preparation of plans and specifications and a call for bids. Its history from then on is a story of the work of engineers—of many difficulties met and overcome. Division Engineer F. W. Haselwood tells of this part of the work, as follows:

The distance from the town of Truckee to the Nevada line near Verdi via the Truckee River is 19.1 miles. The canyon is well crowded with both natural and man-made obstructions. High undulating benches terminating more or less

(Continued on next page.)

DEDICATING TRUCKEE RIVER HIGHWAY—Scenes at the state line when California and Nevada celebrated the opening of the Truckee River highway. *Left,* Chairman Harvey M. Toy of the California Commission presiding at the speaking program; *Center,* left to right; Chairman Toy; Governor Friend Wm. Richardson of California; Governor James G. Scrugham of Nevada; W. B. Gelatt of Donner Lake; *Right,* Governor Richardson making the dedicatory address. (See views of highway on front cover.)

TRUCKEE HIGHWAY DEDICATED

(Continued from page 3.)

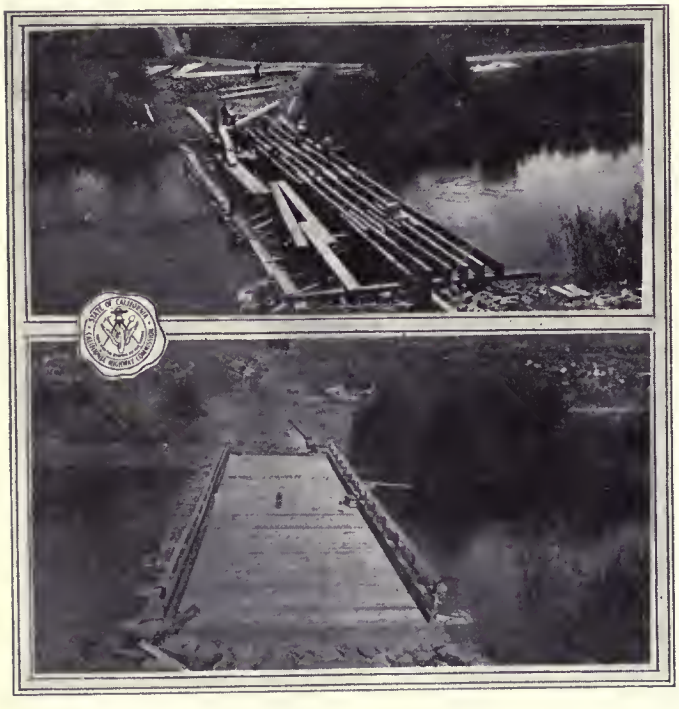
abruptly at the river, precipitous rock cliffs rising from the water's edge cut by deep gorges, lava rims over or from which loose talus slopes to the river, these are some of the natural obstructions. The Southern Pacific has a double track railroad through the canyon on a 400-foot right of way which it jealously guards against any encroachment. There are in addition five pole lines, a paper mill, a power house, a large flume, that lies just below the road for two miles, numerous ice ponds, and three small towns.

The task of projecting a desirable location that would be as free as possible from snow, take advantage of the scenic possibilities and be not prohibitive in cost required considerable ingenuity, technical skill, physical effort and detailed study. All of the location was influenced in some manner by the Southern Pacific and its wide right of way. The result of the location studies, which occupied a period of two years, is a road that fully meets the requirements set. It can be kept free from snow in normal years at little cost; there are scenic views that could be had from no other location and the road is fast and safe with good alignment and grade.

Bridges Part of Project.

In the nineteen miles there are four crossings of the river, one of which crosses the Southern Pacific at the same time, a four-track crossing of the Southern Pacific, a channel change of the Truckee River, high masonry retaining walls and other incidental structures.

The grading work was done in three contracts. The first from Truckee to Boca, a distance of 7.31 miles, was built by Irey and Holden of Lodi in 1924. The second from Boca to Floriston, a distance of 5.8 miles, was also built by Irey and Holden, and was completed in March, 1926. The third unit from Floriston to the state line, a distance of 5.97 miles, was built by the Nevada Contracting Company of Fallon.



Temporary bridge over Truckee River built in six days by young engineer of Division III. It will handle traffic until permanent structures now under way are completed.

The construction of bridges and overhead crossings was directed by the bridge department. A river bridge and an overhead crossing at Hinton are yet incomplete, but a temporary bridge has been built and a good two-way road provided around the uncompleted structures, which, when completed, will eliminate all grade crossings in the canyon.

The work was done with power shovels and dump trucks except two short stretches of team work. Most of the shovels operated double shifts and work was suspended on account of cold weather but a few weeks in the winter of 1924-25. Often as many as five shovels were in continuous operation, two shifts per day.

At two locations deposits of volcanic cinders were encountered which were spread as a temporary surfacing on twelve miles of the road, and as a base course for the rock surfacing to follow next year. On the remaining seven miles adjacent to the Nevada line arrangements have been completed for an application of crushed rock.

The record would not be complete without mention of the men who have been the division's representatives since 1923. J. W. Vickrey was chief locating engineer and after construction started A. R. McEwen and J. L. Piper were resident engineers.

With the opening of the Truckee River highway, the dream of those whose enthusiasm for the river route met and overcame innumerable obstacles is realized, and in the realization let us hope they will in nowise be disappointed.

YOUNG ENGINEER BUILDS TEMPORARY BRIDGE IN RECORD TIME.

TO MAKE possible the holding of the Truckee River highway celebration on the scheduled date, June 10th, it was necessary to open a 0.7 of a mile detour around an uncompleted bridge and overhead grade separation. This involved construction of a temporary bridge across the river.

The Maintenance Department of Division III assigned the task to Assistant Resident Engineer Clyde Rust with orders to complete the bridge in five days, although it was hardly expected that the work could possibly be accomplished in that time.

The Job Starts.

Rust gathered a crew and went to work. The bridge was finished on the evening of the sixth day. It is 102 feet long, 21 feet wide, with a wheel guard and hand rail. It is founded on four rock-filled timber cribs and has held up under passage of a power shovel and heavy trucks.

The feat of the young engineer was related to the Governor and members of the commission, when they passed over the bridge on the initial trip over the new highway.

"STRAIGHT FROM THE CHIEF."

(Continued from page 2.)

financing, location, construction, etc. Some of them were unable to analyze even the simplest of highway economic problems.

THIS situation is a reflection on our system of engineering promotion. It indicates that the younger men are not being sufficiently coached and advised by the men of greater experience and responsibility. It also indicates that the applicants themselves are not using portions of their spare time in the study and analysis of highway economic problems, and are not studying the written matter on the subject, which is constantly being made available to them in engineering periodicals and in book form.

Only by understanding the solution to the problems met with in the job above you, can you expect to demonstrate your ability to fill that position. To inform the examining board that you used a certain method only because it is the standard of the Highway Commission, indicates that you do not have an appreciation of why the standard was adopted. You should know the underlying reasons behind every standard. Mental analysis of the problems in the job above you, and a grasp of the reasons of your superiors for taking certain action, is entirely possible and should be given serious thought by the ambitious engineer.

We hope that the results of the next examinations will show evidence of some study of highway economics, and that a number of our ambitious engineers will be qualified for promotion. Obtaining the services of ambitious men who will think for themselves is the biggest problem confronting any executive.

COOPERATIVE PROJECT COMPLETES NEW WHITTIER BOULEVARD

RECONSTRUCTION OF WHITTIER BOULEVARD—The state highway between Los Angeles and Whittier is now a fifty-six-foot street surfaced with heavy pavement for the entire distance. *Left, above,* Old oil macadam surfacing twenty-two feet wide; (note extreme crown, dangerous to motor vehicle traffic); *Right,* New state highway through Pico, paved with concrete for full width of street. *Left to right, below,* Rebuilding pipe line to care for irrigation; oil macadam scarified to provide base for new pavement; paving approaches and retaining walls at Montebello subway; A. N. George, resident engineer. Reconstruction with gasoline tax funds. (Photos by Div. VII.)

ON ONE of the most historic of southern California roads, a route first trod by the feet of early Spanish explorers, the California Highway Commission has completed the rebuilding of a wide, paved boulevard, from the Los Angeles city limits to Whittier. The county of Los Angeles and a special assessment district assisted the state to the extent of one-half the cost of the project, the state's share of which was financed with reconstruction funds.

This route, a part of the Los Angeles-San Diego trunk highway, Division VII, probably carries the heaviest sustained traffic of any state highway in California. The rebuilding of early pavements, first placed by the county more than ten years ago, on the standards of a city street was determined upon by the commission in 1924 and by successive contracts the work has been pushed forward to completion. The last contract from First street, Montebello, to Philadelphia street, Whittier, 3.3 miles, has just been completed by Kuhn Brothers, contractors.

Whittier boulevard passes through a territory undergoing transition from country to city. Orchards are being subdivided for residential, business, and industrial purposes and problems of both a rural highway and a city street had to be met. Willingness of the county and adjoining property owners to cooperate made possible construction of a pavement fifty-six feet wide, with curbs and gutters, the roadway grade being extended to a width of sixty-eight feet.

Railroad Crossing Eliminated.

In addition to the rebuilding of the pavement, a dangerous crossing of the Union Pacific Railroad was eliminated by the building of an underpass with two twenty-eight-foot openings for traffic. The county, state, and the railroad joined in financing this project, the commission meeting the cost of the pavement through the subway, slope paving and retaining walls, and the lighting and dewatering systems. The railroad consented to the raising of its grade seven feet, so that the floor of the underpass would be above the groundwater level. This proved less costly than the heavier construction that otherwise would have been necessary to resist the hydrostatic pressure of groundwater.

Resident Engineer Describes Project.

A. N. George, resident engineer for Division VII, under whose direction inspection of all paving work was done, tells of the many problems on the Whittier boulevard project as follows:

> Width of most of right of way on Whittier boulevard at the time that it was taken over as a state highway was fifty feet. In recent years, through the efforts of the Los Angeles County Planning Commission no subdivision maps of tracts fronting the boulevard have been accepted for recording which did not provide at least an eighty-foot right of way, and in most cases for a ninety-foot width for the highway.
>
> Many tracts, however, were unsubdivided at the time this improvement was planned. Some of these were fruit orchards or nut groves, with their irrigation systems, while others had been leased in small parcels as business property. These leased tracts were in most cases occupied by flimsy buildings, fronting directly on the old right of way. Thus it was necessary to deal with both the property owner and the lease holder in obtaining the extra width of right of way.

(Continued on next page.)

BOARD OF CONTROL ANNOUNCES PLANS FOR NEW BUILDING

THE State Board of Control, through Chairman George G. Radcliff, has announced plans for the construction in Sacramento of an office building to house the State Highway Department, the Division of Motor Vehicles, and several smaller state departments for which there is not sufficient room in the new state office building. The new building, to consist of several stories, will be located at Eleventh and P streets. It will be financed by San Francisco capital, the state taking a long term lease with an option of purchase, which may be exercised if the legislature makes the necessary appropriation.

Chairman Radcliff has been working on the problem of state offices for many months and the departments which will occupy the new building appreciate his efforts to get them adequately housed, with the particular work and needs of each taken into consideration in the planning of the building.

The proposal to locate the highway and motor vehicle departments in a building of their own has the hearty approval of Governor Friend Wm. Richardson.

MODOC APPRECIATES MAINTENANCE

THE Modoc County Development Board, which has its headquarters at Alturas, has forwarded headquarters the following letter commenting upon the maintenance work being done by Division II on the Redding-Alturas lateral:

MODOC COUNTY DEVELOPMENT BOARD
Alturas, California

June 9, 1926.

California Highway Commission,
Sacramento, California.

Gentlemen:

We wish to send to you an expression of our appreciation of the maintenance work being done by your man, Mr. J. W. Clark, on the Redding-Alturas lateral of the state highway system. The improvement of this lateral is considerably increasing the tourist travel through Modoc County, and we are quite mindful of the assistance that the California Highway Commission has been giving us.

Assuring you of our hearty cooperation in the future, we are,

Yours very respectfully,

MODOC COUNTY DEVELOPMENT BOARD.
By (Signed) O. D. MORGAN, Secretary.

ANOTHER letter regarding conditions on this route has been received by Chairman Harvey M. Toy. It compliments the work being done by J. W. Clarke, one of the Division II maintenance foremen assigned to the Alturas lateral. The letter reads as follows:

MODOC COUNTY BANK
Alturas, California

June 10, 1926.

Mr. Harvey M. Toy,
State Highway Commission,
Hotel Manx,
San Francisco, Calif.

Dear Mr. Toy:

I thought you would be interested in knowing that your Mr. J. W. Clarke, in charge of maintaining the highway from Adin to Cedarville, is doing some very fine work, and we hear a lot of favorable comment on it as well as derive a great deal of pleasure in driving over his roads.

You are to be congratulated on being able to have a man of Mr. Clarke's ability in charge here.

Very truly yours,

(Signed) R. R. BAKER, Vice-President.

WHITTIER BOULEVARD COMPLETED

(Continued from page 5.)

Petty Disputes Required Patience.

Justice required that the state or county should pay for the moving of improvements from the strip of land to be deeded the state for highway purposes. Ornamental fences were moved back to the new property line; retaining walls were replaced with slope pavement; irrigation pipes were moved back onto the property, and the buildings were moved back to front on the new right of way. This takes only a few words to record, but it represents months of patient negotiation and adjustment. Once the resident engineer was summoned from one end of the job to settle a dispute between a house mover and a house owner over the responsibility for the upsetting of a shelf of jelly. Another property owner demanded that the contractor muzzle his mules, while grading operations were under way, to prevent the animals from browsing on the overhanging limbs of the former's walnut trees.

Oil, gas, and water pipes, including a 48-inch water main, traversed the highway, as well as telephone, telegraph, and power lines. Owners of these utilities were asked to move their lines to new locations between the curb line and the new property lines, and although they responded promptly and willingly, the contractor was seriously hampered at times by their presence.

Due to legal complications, it was found advisable to divide the road in halves longitudinally, to permit the state to award a contract for one half, and the assessment district and county the other half. Kuhn Brothers, however, were low bidders on both the state and county projects and from a construction standpoint the effect was the same as if all the work had been awarded in one contract.

Part of the inspectors were furnished by the county and part by the state, all working under the direction of the state representative. There was perfect cooperation at all times.

How the Work was Done.

The actual improvement consisted of a fifty-six-foot concrete pavement, varying in thickness from seven inches at the thinnest points to nine inches at all joints and at the edges. This concrete was placed on a subbase composed of five inches of macadam, salvaged from the original pavement, and decomposed granite. A curb with a face varying from ten to twelve inches was placed on each side of the pavement, which was carried out to the property lines at intersecting streets. The pavement was placed in four 13-foot strips with a two-foot gutter strip next to each curb.

Thus has Whittier boulevard passed through another phase of its evolution from a winding path along which came the padres, to one of the main traffic arteries of the expanding metropolis of the southland.

MAINTENANCE CREW WORKS NIGHT AND DAY TO OPEN BRIDGE.

THE SPIRIT of the Maintenance Department of the California Highway Commission, whose motto evidently is "Traffic Shall Not Stop," was typified recently by the feat performed by a crew of Division X under the direction of Superintendent George Marshall.

While the Rio Vista bridge across the Sacramento River was being opened, the main drive shaft in one of the bascule lifts broke in two places and it was necessary to have a new one made in San Francisco. The gears had to be removed and taken to the San Francisco foundry to be fitted onto the new shaft, which was rushed back by Marshall in his car.

The break happened on Sunday evening and the crew was forced to do most of the work from boats. A high wind, which strained the leaf while in mid air and caused the break, made work from the boats difficult and dangerous. But the crew never faltered. Work went on during the night, all next day, and until 3 a.m. on the second morning, before the bridge could be lowered. Superintendent Marshall did not stop for rest until traffic was resumed.

A contractor called up an architect and said: "Hold my bid, I forgot to figure in the steel and brickwork."

Architect: "That's all right, you're the high bidder anyway."

PIONEER TRAILS OF MOTHER LODE COUNTRY TRANSFORMED BY STATE MAINTENANCE

ON THE MOTHER LODE HIGHWAY—New plan of state maintenance on unconstructed highways has wrought wonders on pioneer trails of the gold seekers in Divisions III and X. *Left, above,* Old road approaching Nashville, El Dorado County; *Right,* New road improved with maintenance funds. (Note improved alignment.) *Below,* Before and after views on another section of same route. *In circle,* section of narrow road on Log Town grade, a 17 per cent climb to be eliminated by relocation. (Photos by Div. III.)

By T. H. Dennis, Assistant Division Engineer, Division III.

"Wonder who has passed here
In the long ago,
Laughing, weeping, sighing—
I shall never know.
Only know the hill trails
As they are today,
The makers of the hill trails
Have long since passed away."

IN COMMEMORATION of these hardy trail makers and as a meed of recognition of their sturdy worth, the Legislature of 1921 designated as a state road what is known as the Mother Lode highway. It extends from Auburn, in Placer County, to Sonora, Tuolumne County, through divisions III and X. The term "Mother Lode" originated with the early miners and was their conception of the source of the gold found in the placer mines of the Sierra foothills. Some held the opinion that it had been washed down from solid ledges far back in the mountains, and this mythical ledge, known as the Mother Lode, was ever the object of their search. As a matter of fact the source of California's placers, which, between 1849 and 1856, produced many millions of dollars, was never ascertained.

The Mother Lode highway act of 1921 provided that the five counties through which the road passed were to provide funds for its maintenance. Whatever repair work was done was the work of Boards of Supervisors until January 1st of this year, when, by virtue of a legislative act of 1925 known as Assembly Bill 589, the state assumed active maintenance of all unconstructed state highways.

Division III Begins Work.

Division III's part of this historic road, 35.3 miles in length, extends from Auburn to the Huse Bridge over the Cosumnes River, the northern boundary of Amador County. This thirty-five miles of road in Division III is divided into four sections, on only one of which, that from Coloma to Placerville, had any maintenance been done by the state prior to January of this year. When taken over by the division, the road in many places was narrow and rough and almost impassable. This article describes what has been accomplished on a particular section south of El Dorado, El Dorado County. It is typical of work being done at various places along the route by both divisions.

The Mother Lode highway traverses the foothills between Auburn and Sonora. It is a rugged country where the mining towns of today exist alongside abandoned hamlets, cabins, and diggings that stir the imagination and recreate again a picture of that happy-go-lucky, devil-may-care race, gathered from many lands by the discovery of gold. The Forty-niners necessarily lived a crude existence, but it was they who first heralded the glory and wealth of California to the far corners of the earth.

To build a road along the trails used by those hardy sons of the gold pan, sluice box, and "Long Tom" rocker is indeed a worthy task. Especially is this true of the section between El Dorado and the Cosumnes River known in the division records as ED-65-C. Starting as a trail out of Mud Springs, now El Dorado, it heads for its objective, the river, with a directness typical of its makers. It pauses not at the summit but plunges downward over a boulder-strewn hillside, known locally as the Log Town grade, for approximately a mile on a 17 per cent gradient. The trail, used for years, was finally worn down to bedrock, the accumulation of disturbed boulders being piled six to eight feet high on each side of the narrow one-track roadway.

(Continued on next page.)

COMMISSION INVITES BIDS ON SURPLUS EQUIPMENT

THE California Highway Commission has on hand some articles of equipment no longer needed for highway work. Much of this machinery is in good used condition and capable of giving considerable service, but on account of changes in policies or methods is not now required by the department.

Those interested in the purchase of any of the articles listed below may inspect the same and file bids with the Superintendent of Equipment of the division where the equipment is located or with the Equipment Department at Sacramento, from whom further information and complete lists of equipment available for sale may be obtained.

The following is a list showing some of the major articles available, together with their present location:

EQUIPMENT IN DIVISION I.

HEADQUARTERS, WILLITS.

C.H.C. No.	Description	Location
1.	Crane, Thew Mod. 00, No. 1647. Traction wheels, 25' boom. Cook upright 2 cyl. gas eng.	Eureka yard
1.	Roller, road, tandem, steam, 5-ton Kelly Springfield	Willits yard
2.	Roller, road, three-wheel, steam. 12-ton Case	Eureka yard
3.	Roller, road, three-wheel, steam. 12-ton Buffalo-Pitts	Mayers yard
5.	Roller, road, three-wheel, steam 12-ton Buffalo-Pitts	Eureka yard
2.	Shovel, Erie Standard, Type B, ¾-yd., steam Traction wheels	Cummings

EQUIPMENT IN DIVISION II.

HEADQUARTERS, REDDING.

C.H.C. No.	Description	Location
6 to 15 inc.	Cars, Matteson, 14½ cu. ft. 18" gauge, plain bearings, turn-table steel body and truck mine dump	Redding
27.	Engine, gas, 30 h.p. Stover.	Redding
28.	Engine, gas, 32 h.p. Fairbanks Morse, type N	Redding
24.	Engine, gas, 25 h.p. Doak	Redding
26.	Engine, gas, 30 h.p. Doak	Redding
11.	Roller, road, three-wheel Austin, 10-ton gas type, S-14	Redding
13.	Roller, road, three-wheel Austin, 10-ton gas type, 1-700	Redding
16.	Roller, road, three-wheel Kelly Springfield, 10-ton gas. No. 3471	Redding
10.	Tractor, Mogul. No. 5 D. Model 8-16	Redding

EQUIPMENT IN DIVISION III.

HEADQUARTERS, SACRAMENTO.

C.H.C. No.	Description	Location
1 & 2	Buckets, clamshell, ¾ cu. yd. Lakewood type, 641 B	Sacramento
21.	Roller, tandem, steam, 5-ton Kelly Springfield	Sacramento

EQUIPMENT IN DIVISION IV.

HEADQUARTERS, SAN FRANCISCO.

3.	Bucket, clamshell, ¾ cu. yd. Lakewood type 641	San Jose
4.	Bucket, clamshell, 1¼ cu. yd. Williams	San Jose
3.	Hoist, steam, Clyde, 3-drum, 50 h.p., 8" x 12" with 4" x 6" swinging eng.	San Jose
11.	Hoist, steam, Washington, 2-drum 25 h.p. Model 747S, 7" x 10"	Fruitvale
40.	Mixer, concrete, Foote paver. 2-sack with Novo Eng.	Fruitvale

EQUIPMENT IN DIVISION V.

HEADQUARTERS, SAN LUIS OBISPO.

4.	Derrick, American, 5-ton stiff-leg 45'. 14" x 14" Mast 60' 12" x 14" boom	San Luis Obispo
5.	Hoist, steam, 3-drum, Clyde, 50 h.p. 8" x 12" cylinders	San Luis Obispo

EQUIPMENT IN DIVISION VI.

HEADQUARTERS, FRESNO.

25.	Crusher, rock. No. 5 Champion. 11" x 20" jaw	Bakersfield
5.	Derrick, American stiff-leg 45', 14" x 14" mast 60' 12" x 14" boom	Bakersfield
45.	Roller, road, steam, tandem. 5-ton Erie	Fresno
46.	Roller, road, steam, tandem. 5-ton Kelly Springfield	Fresno
59.	Mixer, concrete. Paver, Foote. 1-sack traction, 6 h.p. Fairbanks-Morse	Merced

PIONEER TRAILS TRANSFORMED

(Continued from page 7.)

A relocation three and one-half miles in length eliminates an equal distance of the old trail, including the Log Town grade. A less strenuous route is to be followed to the Huse bridge, the road lying along the hill sides at times above and again in close proximity to the beautiful Cosumnes.

The ruggedness of the country and the condition of the roadway would not permit of half-way measures. To spend money on the road in its present location, which in time would have to be abandoned, was out of the question. To meet the situation, Division Engineer F. W. Haselwood asked the El Dorado County Board of Supervisors to assist in securing a new right of way for the better maintenance of the highway.

Supervisor W. S. Biggs, through whose district the road passes, set to work enthusiastically and with the exception of that portion which provided for elimination of the Log Town grade was able to secure an 80-foot right of way. In addition he financed the erection and replacement of necessary fencing.

Heavy Equipment Necessary.

Upon completion of these negotiations, Maintenance Foreman C. G. Sackett of El Dorado began operations. He had a crew of fourteen hard-rock men, equipped with hand steel and double jacks, a 30 Best tractor, an 18-foot Pacific revolving scraper, and an 8-foot Standard leaning wheel grader. Necessity of heavy drifting and grading and the size of the numerous boulders made it apparent that this type of equipment was too light. Accordingly, a 60 Best tractor, a 12-foot Russell grader, and a 3-yard land leveler were rented and placed on the job.

Heavy bank cuts were made, trees and large boulders pushed aside, and many yards of embankment made. Hanging to the side hill under precarious traction, this outfit, under the capable direction of Foreman Sackett, fought its way through and produced a road which, in the time occupied and equipment and labor used, would have elicited the admiration of those same pioneers whose trail he has replaced.

To date six and one-half miles have been improved, three and one-half on the El Dorado end and three on the river crossing end, at an average cost of $700 to $800 per mile. The El Dorado Superior Court has granted an order of possession for new rights of way for the elimination of the Log Town grade and this work is now starting. Completion of this latter section will make possible comfortable travel over the El Dorado section of the pioneer trails, made historic through the tales of Bret Harte and Mark Twain.

SERVICE TRUCK EQUIPPED.

A service truck equipped as a traveling branch office of the Division of Motor Vehicles has been fitted up for that department by the headquarters shop of the Highway Commission. The truck is equipped to test headlights, weigh an overloaded truck, issue license plates, explain the kinks of the motor vehicle laws to a perplexed farmer, or do anything else coming within the scope of motor vehicle acts. It is making trips through various sections of the state.

Nature keeps things balanced. Europe has the most wars, but we have nine times as many automobiles.

TESTS OF OIL FOR DESERT SAND TREATMENT

By C. L. McKesson, Materials and Research Engineer.

FROM the highway engineer's viewpoint it sometimes appears that all agencies are combined in an effort to destroy the highway which he has striven to make permanent.

Overloaded vehicles do their part but natural forces are even more active. Swelling and unstable soils, alkali, extreme temperature changes, floods and wave action along the coast are some of the better known destructive agencies. In some localities the wind joins other natural forces in the attack on the highways. In fact wind alone, if given free scope, would soon efface some of the highways.

The sand hills section in Imperial County, in California, is one on which highway engineers have battled the wind ever since highway construction began in that section. Since the construction of the temporary plank road across these dunes, each heavy wind storm has buried long stretches of the highway beneath deep sand drifts in some ways not unlike the snow drifts of other regions. Thousands of dollars have been expended in removing the sand only to have it replaced by the next storm.

The Oregon highway department has waged a similar battle with drifting sands along the Columbia River east of The Dalles, and in a single wind storm has lost long stretches of newly graded highway. Before the advent of the Columbia River highway the railroad had been for years engaged in a struggle against the drifting sands, and perhaps it is to its engineers that we are indebted for the initiation of the practice of oiling as a protection against wind action. The Oregon Highway Department after a few rather disastrous experiences adopted oil protection, to the extent of oiling large areas on the windward side of the highways as well as the highway right of way and the slopes. The work done by them and the equipment used was described by A. F. Morris, in *Public Roads,* for August 1920.

Protection Planned for Sand Hills.

In planning the new highway across the sand hills section, engineers of the California Highway Commission responsible for design and construction decided to utilize oil for slope and shoulder protection, and the Testing and Research department was asked to make tests to determine character of oil suitable for the work and the amount required.

Rather simple tests were made which, it is believed, indicate service values. These tests will be described for the benefit of those interested in the problem of drifting sands or wind erosion.

In making the tests various oils were used with asphalt contents up to about 65 per cent. The experiments have demonstrated that the oil best suited for the work should contain 40 to 50 per cent of asphalt. Oil of this kind can be applied without heating and will penetrate readily. There is a sufficient asphalt content to give good body and to hold sand particles together in a heavy flexible mat after the more volatile oils have evaporated.

A large sample of the desert sand for test purposes was obtained from Division Engineer E. Q. Sullivan. The sand was placed in pans having an area of one square foot and the oil applied in a finely divided spray under an air pressure of 50 pounds. Repeated trials indicated that one-half gallon per square yard was the least amount that would entirely cover the sand. The lighter oils were applied cold and the heavier oils were heated. After the application of oil, the resulting oil cake was cut in small squares and the average thickness measured. The values given in the following table are averages of a number of samples.

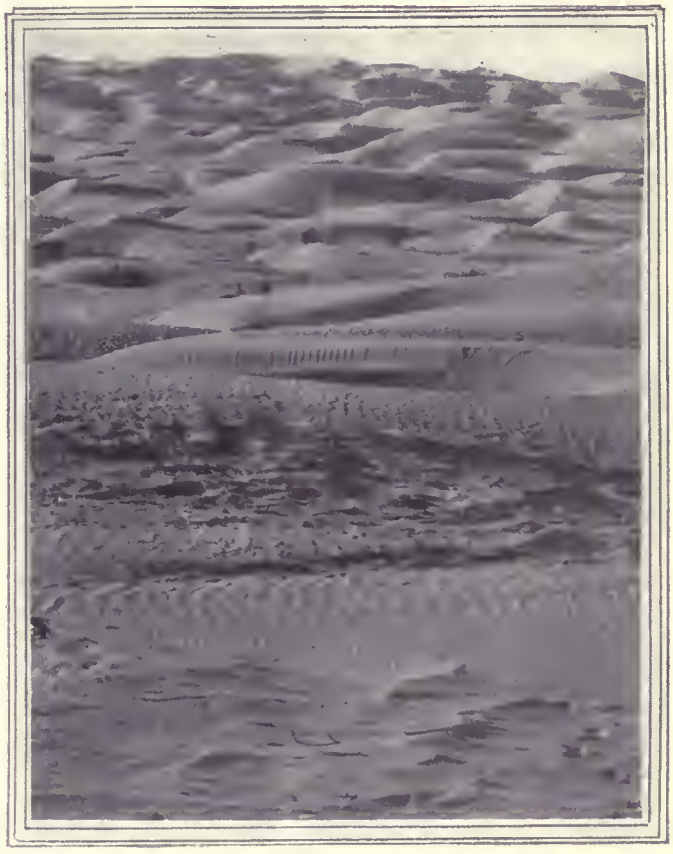
After measuring the penetration of oil in the cold sand the pans containing the sand were placed in an oven and maintained at a temperature of 150° F. for one week and the depth of penetration again determined. This was done to determine maximum probable penetration which will be obtained in the summer time under desert heat conditions.

Results of Tests.

Penetration of desert sand with various asphaltic oils:

Kind of Oil	Sp. Gr. Be	Amt. per Sq. Yd. Gal.	Penetration Cold Sand	Penetration 150° F. 1 Week	Remarks
43% Asphalt	18.2°	½	¼	¾	Applied at about 75° F.
		¾	⅝	1¼	
		1	⅞	1½	
Fuel Oil	17.2°	½	½	¾	Applied at about 75° F.
		¾	⅝	⅞	
		1	¾	1⅛	
50% Asphalt Road Oil	16.8°	½	¼	½	Applied at about 75° F.
		¾	¾	1¼	
		1	1¼	1¾	
62% Asphalt Road Oil	15.2°	½	¼	¾	Applied 150°-175° F.
		¾	½	¾	
		1	¾	1¼	
65% Asphalt Road Oil	13.7°	½	½	¾	Applied 150°-175° F.
		¾	¾	1	
		1	1	1⅜	

A Diesel oil was also tested but it lacked "body" and did not produce a good oil mat on the sand.



IMPERIAL COUNTY SAND HILLS—A close-up of a section of the six miles of dunes across which a pavement is now being placed. Shoulders and slopes will be oiled to prevent erosion by winds.

All of the oils gave good mats of oil and sand but the lighter oils gave good penetration without heating and were therefore recommended for use.

Oiling as above described gives protection against drifting sand when adjacent dunes and sandy areas are oiled and is also useful in preventing erosion of sand fills by wind and water.

SAN JUAN BRIDGE JOB IN SOUTH SHOWS HIGH STRENGTH CONCRETE

MORE than fifty samples of concrete taken during the construction of the San Juan bridge on the Los Angeles-San Diego highway, in Orange County, after test at the headquarters laboratory, show average strengths at twenty-eight days of 2890 pounds for Class C (mass concrete in piers) and 3900 pounds for Class A concrete going into other parts of the bridge.

These are some of the interesting facts concerning this project contained in a report of A. J. Meehan, resident engineer for the bridge department. The bridge is not the first to span San Juan Creek at the present site, two predecessors having been washed away by sudden floods which sometimes occur in the locality. The present heavy reinforced concrete structure replaces a temporary wooden bridge erected several years ago following a flood.

Precautions Taken.

Because of past experience with the stream unusual precautions were taken in building the new bridge. The channel was enlarged fifty feet by removal of restricting roadway fills, slope paving was placed along both banks and bases of channel piers were extended fourteen feet below the bed of the stream and founded upon timber piles thirty feet long. The bridge terminals are each supported by a reinforced concrete beam capping four thirty-foot reinforced concrete piles.

The total length of the bridge is 180 feet. The three channel spans are each forty-six feet in length as compared with eleven feet in the old bridge. The greater length was provided to enlarge the waterway, which was further enlarged by an increase of more than a foot in the under clearance. The end spans are each twenty-one feet in length and the clear roadway width thirty feet.

Parts of former bridges which had to be removed while excavating for pier foundations caused the contractor considerable annoyance and delay. Blasting was necessary and water jets had to be used to facilitate driving of piles.

Abrams Theory Followed.

Abrams fineness modulus theory of concrete proportioning was applied throughout construction. Over fifty samples of concrete were taken and the range of laboratory results are tabulated below:

When comparing these tests with others, consideration should be given the following items:

1. Except in mass sections of structures, the use of rock larger than 1½" is prohibited by physical conditions whereas its use as in pavements, contributes to strength.

2. Low cement content in Class "C" concrete.

3. More water is required in bridge concrete than paving because of form and reinforcing restrictions.

4. Absence of machine tamper on this contract required more water in the pavement mixture.

Class concrete	Sacks cement per cu. yd.	Slump average	28-day high	Strength low	(Lbs. sq. in.) average
"A" Bridge	6	3"	5740	2900	3900
"A" Slope paving	6	1⅞"	4910	3830	4490
"A" Paving	7	1⅝"	5290	3970	4710
"C" Bridge	4.2	1¾"	4050	1860	2890

Stevens Brothers and Haas were the contractors. The project being reconstruction was financed with gasoline tax and federal aid funds.

OLD AND NEW—*Above,* old San Juan bridge on state highway in Orange County. *Below,* new reinforced concrete structure recently completed by the Bridge Department. Opening for flow of storm waters has been considerably increased.

CLAIM OF DIVISION VII TO BEST TRAFFIC MARKER IS DISPUTED

FROM articles reaching the Bulletin office, it is evident a rivalry has arisen between Divisions VII and X as to the ability of their respective maintenance departments in the perfection of traffic-marking devices. More than a year ago the Bulletin described a marker built by Superintendent B. W. Bicksler of Division X. Sometime later Division VII put forth the "Henry" marker. Now Division X says its marker has been improved and is "equally efficient."

Referring to the recent description of the Henry marker, which appeared in the issue of February, 1926, a communication from Division X says:

> Superintendent Bicksler has now improved his device, so that it is equally efficient in painting a traffic stripe or spraying it with asphalt. When spraying hot asphalt, the attachment is fastened to a Ward oiler instead of a White truck, as originally used. Only two men are required to operate the truck and spray outfit. A guide wheel fastened to an outrigger runs along the pavement edge or along the center longitudinal joint, which ever is desired.

Experimental stripes have been sprayed on a twenty-foot concrete pavement south of Sacramento, using XX asphalt, Gilmore asphalt, and Gilmore asphalt sanded. The latter type is proving the most satisfactory as it does not track and leaves a very clean-cut job which turns black after a few weeks. When the pavement is wet or muddy, the sanded strip shows up much better than those not so treated.

The above mentioned device applies the sand on the asphalt stripe immediately behind the spray. Superintendent Bicksler still maintains he has the best and most efficient appliance for this work now in use in any of the divisions.

FOREMAN KILLED FIGHTING FIRE.

While assisting his men in an attempt to extinguish a fire on a wooden bridge across the Klamath River near Orleans, Humboldt County, Foreman U. S. Grant was killed when the bridge collapsed. He fell fifty feet into the river. Another member of the crew was injured.

The structure was of the suspension type and was built by the Forest Service during the construction of the Klamath River highway, added to the state system by the bond issue of 1919.

Foreman Grant was of Indian blood and was only recently employed by Division II. He was formerly in the service of the Bureau of Public Roads. The accident occurred on Sunday, June 13th.

WELDED PIPE LINE USED ON DIVISION VII PROJECTS

SUBSTITUTION of welded pipe lines for the former system of screw pipe is being tried on concrete paving projects in Division VII. A description of the plan used on the Jahn & Bressi contract, north of San Juan Capistrano, is furnished by C. N. Ainely, resident engineer.

Jahn & Bressi contracted with the pipe company for the complete handling of the pipe during the period of construction. The pipe used, secondhand boiler tubing, is strung out over portions of the job where it is to be needed and is then welded by means of an acetylene torch. The cost of installing, which includes welding joints and pipe stubs for hydrants at 100-foot intervals, was reported to have been 3½¢ per foot for 3″ pipe and 5¢ per foot for 4″ pipe.

With the joints laid end to end as unloaded from the truck, one man can average 35 welded joints per day. The time of welding in a stub for hydrants is about 10 minutes.

Advantages of Plan.

The use of welded pipe has a number of advantages. The line can be shifted without danger of breaking, if ordinary care is used; a leak or break is easily repaired, and the line is readily disconnected with the torch for moving.

The boiler tubing with the welded joints used on this job will stand about 500 pounds pressure. It is asserted that there is no noticeable increase in friction head due to the use of this pipe; in fact, friction is decreased. Welded pipe has been used on two jobs with success, which, apparently, establishes the fact that it is cheaper than former methods.

Method followed in welding pipe for water supply, Division VII concrete paving project; and, *above*, equipment of subcontractor supplying and operating pipe line.

California and Nevada signs at state line on Truckee River highway.

NEVADA ENGINEERS FAIL IN EFFORT TO BEST DIVISION III

DETERMINATION of Division III to have the Truckee River highway in the best possible condition for its opening on June 10th, was responsible for the failure of plans of Nevada highway engineers to place the first marker at the state line.

Division Maintenance Engineer T. H. Dennis, just before dark on the evening of the 9th, made a final trip through the canyon to see that everything was in readiness for the opening ceremonies. At the state line he came upon a crew of the Nevada Highway Department erecting a large sign on the Nevada side, which read, "SILVER STATE."

Work Through Night.

Dennis hurried back to Truckee. He was told the local constable was the only sign painter in town. Dennis found the officer and explained the situation. Constable Titus put his deputy on duty and went to work. All night long he and his wife and daughter toiled to fulfill their promise to Dennis.

When the Nevada caravan arrived at the state line in the morning, it was greeted on the California side by a handsome sign with a blue background and gold letters, which read, "THE GOLD STATE."

"I put up my sign just about three hours too soon," Division Engineer Sam Durkee said to Dennis when the two met at the dedication ceremonies.

IMPORTANCE OF SMOOTH ROAD SURFACES.

EXPERIMENTS by A. T. Goldbeck at the Arlington Experimental Station of the Bureau of Public Roads indicate that a 5000-pound wheel load moving at 20 miles per hour would produce a stress which could readily be carried by a 6-inch smooth concrete slab, but which in a slab having ½-inch unevenness would require a thickness of 10 inches of concrete to carry the stress. Similarly, a 6-inch smooth slab would be subjected to no greater stress than a 7-inch slab having a surface variation of ¼ inch.

These tests illustrate the extreme importance of obtaining a smooth surface finish on concrete roads and joints in a perfect plane.—C. S. Pope.

A TOUGH JOB.

Resident Engineer A. N. George was confronted with the problem of laying five pipe lines within an eight-foot parking. A 48″ line, a 36″ line and three 12″ pipe lines.

Someone came to George's assistance with the solution: "Put the 36″ pipe inside the 48″."

This is just one of the many details Mr. George had to take care of on the Whittier boulevard job, Division VII.

WHAT THE DIVISIONS ARE DOING

DIVISION I COMMENTS ON USE OF STEEL TRAFFIC TREADS

AN EXPERIMENT with AW steel traffic plates has been under way in Division I since February, when treads were installed on the Jordan Creek bridge, a wooden structure on the Redwood highway about five miles south of Scotia, Humboldt County. The plates have now been in service for a period of approximately four months.

Commenting upon the results, Division Engineer T. A. Bedford has this to say:

> Four lines of traffic treads, 20 inches wide and ⅜ inch thick, were installed on the Jordan Creek bridge, 140 feet in length, as a protection to the wooden floor.
>
> Approaches to this bridge are on curves and the plates are laid on tangents. As a result machines run off the plates at each end and in the middle for the reason that, in a length of 140 feet, drivers do not notice the treads until they are nearly across the bridge.

Not Advisable on Short Structures.

> Observations would indicate that, for best results, installation of traffic treads should not be made on bridges of less than 200 feet in length; more particularly if the roadway at the approaches is on a curve.
>
> There is reason to believe that on long bridges drivers will follow the plates and that the life of wooden floors will thereby be materially increased. Better results will be obtained if plates with a width of 24 to 30 inches are used instead of the 20-inch size installed at Jordan Creek. The wider plates will be worth the difference in cost because of the greater ease with which they can be followed by traffic.

TRAFFIC TREADS ON WOODEN BRIDGE—Division I is trying steel traffic treads to prolong the life of wooden bridges on the Redwood highway. View above shows installation at Jordan Creek.

FINED FOR CUTTING TREES.

For cutting trees on the state highway right of way in Division IV, a resident of San Mateo County recently was fined $10. The complaint was filed by a representative of the division because the cutting was done without a permit. Requests for permits to cut or remove trees from the highway are always carefully investigated and every effort is made to obviate removal of trees whenever possible.

A man who can speak six languages has just married a woman who can speak three. That seems to be about the right handicap.—*Punch.*

DIVISION III.

HEADQUARTERS, SACRAMENTO.

F. W. HASELWOOD, DIVISION ENGINEER.

Counties of Butte, Colusa, El Dorado, Glenn, Nevada, Placer, southern Plumas, Sierra, Sutter, Yuba, and northern Sacramento and Yolo.

WITH the Truckee River highway completed and open to traffic, Division III is now turning its attention to one of the big problems before it—the building on adequate standards of a highway about the shores of Lake Tahoe. After months of planning and negotiation with property owners for rights of way, work is now under way at several locations along the west shore.

From now on whatever new work is done on the route around the lake will be on new alignment. Deeds for an eighty-foot right of way are being secured, and it is the expectation of the division that several miles of new road will be completed and surfaced by the end of the present summer. J. W. Vickrey is in charge of construction operations.

Survey parties are now making a location over Cascade Ridge at Emerald Bay, Lake Tahoe. A relocation is also being made on Route 39 along the north shore of the lake.

Work Starts Above Placerville.

Work of grading at several points between Sportsmen's Hall and Riverton on the Placerville-Tahoe route, Irey and Holden contractors, is now well under way. The contract includes surfacing of the entire section. J. L. Piper is resident engineer.

An informal contract has been awarded A. L. Williams for surfacing work between Marysville and the Seven-mile house on the Tahoe-Ukiah highway. Clifford Yost is in charge for the state. Yuba County is assisting in financing the project.

On the trunk highway between Donner Lake Camp and Truckee numerous improvements have been made, including the placing of considerable new surfacing. A. C. Irish, assistant resident engineer, is in charge.

Progress on Bureau Project.

Excellent progress is being made by the Isbell Construction Company, contractors, on the Forest project for grading a 4.5 mile section of the Truckee-Tahoe City highway, a part of the state system. The government has the option of extending the contract for a second unit of 4.5 miles, if sufficient funds are appropriated by congress. The United States Bureau of Public Roads has charge.

On the Tahoe-Ukiah highway, west of Grass Valley, surfacing is being placed by state forces which are using the Grass Valley crushing plant at the North Star Mine.

Oiling to Prevent Dust.

Superintendent H. D. Miller is engaged in spreading oil as a dust preventive. About 100 miles in the division will be oiled during the summer.

In addition to the Mother Lode highway, one of the interesting routes taken over by the commission under the new policy of state maintenance is the Oroville-Quincy ridge route by way of Bidwell Bar, Merrimac, and Meadow Valley. The accomplishments of Foreman C. P. Butz in charge on the Butte County side and of Foreman A. S. Brown on the Plumas end have been favorably commented upon in the Oroville *Register* by George C. Mansfield, former state highway commissioner.

DIVISION V.

HEADQUARTERS, SAN LUIS OBISPO.

L. H. GIBSON, DIVISION ENGINEER.

Counties of San Benito, Monterey, San Luis Obispo, and Santa Barbara.

DANGEROUS grades over Ortega Hill were eliminated from the Coast highway, when Division V, on June 3d, opened to traffic the newly graded section of state highway extending through Summerland to the Santa Barbara city limits. The old grade over the hill is replaced by a new direct route considerably

shorter than the old county road. A rock surfacing will be maintained until fills have had time to settle, when a permanent pavement will be placed.

A feature of the new alignment is a wide parking place on the bluff on the side of Ortega Hill from which an inspiring view of Santa Barbara channel may be had. A safe stopping place for motorists has been provided at this point. The McCray Company was the contractor on this project with E. B. Brown as resident engineer.

The Cornwall Construction Company has just completed the placing of a new section of state highway in the vicinity of Carpinteria, Santa Barbara County. A 30-foot pavement was placed through the town proper and a 20-foot pavement for two miles southerly. E. B. Brown was resident engineer.

Pismo Change Almost Ready.

Grading for the Pismo line change, San Luis Obispo County, is about completed and opening of the new highway to traffic early in July is now expected. The new bridge across Villa Creek and the overhead crossing of the Southern Pacific Railroad, built under the direction of the bridge department, have been completed and the finishing of the fill will make useable an excellent line change. It considerably shortens the distance, eliminates numerous dangerous curves, and a railroad grade crossing. J. L. Webster of Chico built the bridges while the grading was done by Collins and Seppi of Stockton. Chas. P. Sweet was acting resident engineer for the division.

Preliminary work on the Santa Barbara-Goleta widening project is being started by the Cornwall Construction Company, contractor. E. B. Brown will be resident engineer.

San Juan-Hollister Job Progresses.

Reconstruction of 6.9 miles of the San Juan-Hollister highway is now under way, the contract having been awarded to the Granite Construction Company of Watsonville. Cement concrete shoulders will be placed with a second-story bituminous macadam surfacing over the old pavement. R. S. Badger is resident engineer.

A crew under the direction of Foreman Roy S. Peck is rapidly completing the flooring of the San Benito River bridge on the San Juan Bautista-Hollister route.

Paul M. Joseph is in charge of the rebuilding of the San Jose Creek bridge and repair of other county bridges on the Carmel highway along the Monterey coast. This route was taken over for maintenance on January 1st.

Maintenance crews have discovered that puncture vine has been brought into Division V, presumably by automobiles traveling over lateral roads from the San Joaquin Valley.

DIVISION VI.

HEADQUARTERS, FRESNO.

E. E. WALLACE, ACTING DIVISION ENGINEER.

Counties of Fresno, Madera, Merced, Mariposa, Kings, Tulare, and Kern, north of the Tehachapi.

ROUGH grading has been practically completed on the Merced canyon entrance to Yosemite Valley. Completion of the grading is being followed as rapidly as possible by placing of rock surfacing. It is the purpose of the division to have the entire seventeen miles surfaced and oiled prior to the opening date for the highway, July 31st.

In addition to the work between Briceburg and El Portal arrangements have been made for oiling the 37.7 miles of the Yosemite lateral from Briceburg to the westerly border of Mariposa County. This is being done as a dust preventive measure.

The division is looking forward to the erection of a division office building on the 3.5-acre site recently acquired by the commission at the northern limits to Fresno. Bids for the building were opened on June 14th. A division shop building already has been completed on this property.

Park Lateral Improved.

Curve widening on the Sequoia National Park lateral east of Visalia has caused much favorable comment. A greatly increased traffic is reported on this highway to date this summer.

A power shovel has been building levees and constructing drainage ditches on the Cholame lateral, in the vicinity of Lost Hills, to take care of future flood waters. Considerable damage was done to this highway by cloud bursts during the spring.

Maintenance crews are making a number of experiments in the campaign against puncture vine, which was developed into an all-year-'round battle in Division VI.

DIVISION VII.

HEADQUARTERS, LOS ANGELES.

S. V. CORTELYOU, DIVISION ENGINEER.

Counties of Los Angeles, Ventura, Orange, San Diego, and eastern Kern, south of Mojave.

WORK of improving the alignment, eliminating "blind" curves, and widening shoulders and fills on the Ridge route in Los Angeles County, by state forces, has now progressed to a point two miles northward beyond Reservoir Hill, a distance of over twenty-one miles from where the work was started near Castaic School in May, 1924.

A contract is now nearing completion for the widening of the pavement on the ridge on the inside of curves, where the alignment has been changed. This widening is being done by constructing crescent-shaped areas of macadam.

KEEPING TRAFFIC MOVING—Maintenance crews in Ventura County, Division VII, used teams to get traffic through the mud washed onto the pavement by unprecedented rains during April.

San Diego Paving Near Completion.

Rapid progress is being made on the Jahn & Bressi contract north of Oceanside in San Diego County. Ten and one-half miles of concrete pavement have been placed, 20 feet wide. From Stuart southerly toward Oceanside for a distance of three miles, the concrete pavement has been laid half width. On the one and one-half mile extension to the contract, extending the work into Oceanside, most of which is on new right of way, the shovel is working two shifts to complete the grading ahead of the paving crew. A new underpass crossing of the Santa Fe tracks is under construction, just north of Oceanside.

On the Coast highway, in Ventura County, between Camarillo and Ventura, good progress is being made on the contract for widening and thickening the old 15-foot concrete pavement. The new pavement is now open to traffic from Ventura easterly to El Rio.

Except on the line change near the Big Tujunga, where grading operations are nearing completion, all culvert and paving work has been finished on the contract for widening of the Foothill boulevard between San Fernando and La Canada.

Serious rock slides have continued to occur on the Ventura coast route and several power shovels are now at work removing a large yardage of accumulated rock and earth, which must be removed before this route can be opened to traffic following completion of grading farther south.

According to George E. Reynolds, managing editor of the Stockton *Record*, the Big Oak Flat road into the Yosemite was a "veritable boulevard clear up to the national park line" on the occasion of the recent sociability run of the Stockton Chamber of Commerce.

Commission employees from headquarters and the other highway department offices in Sacramento motored to Olympia Park, near Grass Valley, on Sunday, June 20th, for a picnic, dancing and swimming party. R. W. McCrea was active in making arrangements.

DIVISION VIII.

HEADQUARTERS, SAN BERNARDINO.
E. Q. SULLIVAN, DIVISION ENGINEER.
Counties of San Bernardino, Riverside, and Imperial.

THE 14.5 miles of reconstructed pavement between Riverside and Ontario, placing of which has been under way for several months, was scheduled for completion and opening to traffic late this month. That the new pavement, which was financed by the gasoline tax, is appreciated by residents of the communities on the route, is evidenced by the following quotation from a recent issue of the Ontario *Daily Report*:

For some time the road between Ontario and Riverside has been closed while being widened and resurfaced. When it is opened shortly, the splendid surface over which motor cars will skim will more than offset the inconveniences of the "best temporary route" detours that have confronted motorists recently.

The road is now open between Riverside and Collins station. It will soon be open to Ontario and the entire stretch will be a revelation to people who have not been over that portion already finished and opened to traffic.

The writer was over that part recently between Wineville and Riverside and was so delighted with the improvement that he wrote to the Highway Commission for some definite data about it.

This reply was received from Division Engineer E. Q. Sullivan at San Bernardino:

"The old 18-foot pavement is being widened to 20 feet, and a new top of asphaltic concrete is being put on. The thickness of asphaltic concrete varies from two to six inches, depending on the condition of the old pavement over which it is placed.

WHAT APRIL SHOWERS DID—Scene in Arroyo Seco, Division VII, where roadbed was washed away by a cloud burst. Spring rains made heavy and unexpected calls on maintenance funds in several of the divisions.

Wider and Better.

To make a still further improvement, disintegrated granite is placed on each side of the pavement for a two-foot width to avoid danger when cars may get off the pavement on the natural sandy soil.

The cost per mile for this job was slightly over $14,000; a total cost of $207,000 for the 14½ miles. This is an exceptionally low price for this type of work. In view of this low price, the very good work done by the contractor, Steele Finley, is particularly gratifying."

Work on National Old Trails.

Improvement of the National Old Trails between Mincola and Hector, a distance of 20 miles, has been begun. The highway is being graded and rock surfacing is being placed on sandy sections.

Matich Brothers, contractors, have started work on their contract for the widening of the highway between Whitewater and Edom, on the San Bernardino-Imperial Valley trunk highway. The existing 16-foot pavement will be widened to 20 feet by placing a four-foot cement concrete shoulder. While this is desert country, the contractors expect to continue operations through the summer.

Two miles of asphalt concrete pavement have been completed on the Sand Hills job and the contractors now assert that they will complete the job without suspension of operations, unless the summer heat becomes too great.

Placing of a second-story cement concrete pavement between Beaumont and Banning, 20 feet wide, has been completed and opened to traffic.

DIVISION IX.

HEADQUARTERS, BISHOP.
F. G. SOMNER, DIVISION ENGINEER.
Counties of Inyo, Mono, and eastern Kern County, north of Mojave.

THE Tioga road, scenic eastern entrance to Yosemite National Park, was opened to traffic this year on June 4th, a month earlier than the previous record for the opening of this highway.

Erection of log bridges is planned to overcome interruption of travel on the Sonora Pass road caused by high water in tributaries of Walker River. Rapid melting of snow resulted in streams flooding the roadway.

Contracts for surfacing work on the work on the 37-mile section between Ricardo and Five-Mile canyon, Kern and Inyo counties, are about completed and ready for acceptance. The work has been done by Harry Wilson and Callaway and Voss.

Flood Damage to be Averted.

Considerable work has been done between Mojave and Red Rock canyon to prevent reoccurrence of damage to the highway in this section, which follows frequent cloud-bursts in the mountains to the west. A ditch and levee have been constructed parallel to the highway for a distance of eight miles.

With the cooperation of the City of Los Angeles, paved dips will be built at points where there are outlets from the city's aqueduct. These paved dips will prevent washing of the roadway when the aqueduct overflows following storms.

DIVISION X.

HEADQUARTERS, SACRAMENTO.
R. E. PIERCE, ACTING DIVISION ENGINEER.
Counties of Amador, Calaveras, Alpine, Tuolumne, Stanislaus, San Joaquin, Solano, and southern Sacramento and Yolo counties.

CONSTRUCTION of a sand fill embankment for an approach to the M street bridge, in Yolo County, has been completed by H. V. Tucker Company, contractor, and bids have been asked for a concrete pavement to complete the new western entrance to Sacramento.

Sand for this work was secured from the Sacramento River, using a six-yard clam shell dredger to deposit it on the top of the west levee. From this stock pile it was sluiced into place through timber sluice boxes. This method proved very satisfactory except for a distance of about 400 feet farthest away from the river. For this distance a dragline was installed to move material from the end of the sluice to the end of the job. The work of finishing was done with fresnos, blade and mules.

Reconstruction of that portion of the state highway in Stanislaus County from Modesto to the northerly boundary is progressing satisfactorily. The Valley Paving and Construction Company has started placing the cement concrete shoulders.

Experimental Oiling Under Way.

Repairs to the Mokelumne River bridge at the Amador-Calaveras County line have been completed by maintenance forces. The old deck and guard rail have been removed and replaced with new laminated deck and standard guard rail.

Division X has inaugurated a program of oiling gravel roads. The first sections to be treated were portions of the Alpine highway east and west of Jackson. Experiments are being tried on stretches of road in various parts of the division. Results of the oiling under varying different conditions will be studied by the Maintenance Department.

Life is that way, too. You're usually advanced to second and third, but getting to first is your own job.—*Wilmington Dispatch.*

BRIDGE DEPARTMENT NEWS

HARLAN D. MILLER, Bridge Engineer.

THE GREAT Ventura seawalls, probably the longest of their kind in the world, have been completed and back filling and removal of the old wooden trestles is now under way. The walls have a total length of 6391 feet. They contain approximately 16,000 cubic yards of concrete, in the making of which nearly 100,000 bags of cement were used.

El Portal Bridge Finished.

The new bridge over the Merced River near El Portal on the Yosemite entrance has been completed and turned over to the commission. Stewart Mitchell was resident engineer. Four other

MONTEBELLO SUBWAY—*Above,* Crossing of Union Pacific Railroad and narrow macadam pavement at Montebello, Whittier Boulevard, Los Angeles County. *Below,* New subway recently completed by the Highway Commission, the railroad and county cooperating. Each opening has a width of thirty feet for one-way traffic.

structures are under way on the highway through the Merced canyon with Albert A. Lernhart as resident engineer.

Work on the new bridge across Santa Maria River, on the Coast highway, has been started by Rocca and Caletti. John C. Wilson is resident engineer.

Contracts for widening the Rio Honda and the Santa Ana River bridges in southern California were recent awards of the commission. Work will be under way on both structures by the time this is in print. A. S. Kennedy represents the state on the Rio Honda bridge.

The San Pablo Creek bridge, Contra Costa County, is being reconstructed on new alignment and with a greater width. R. B. McKenzie is the contractor and L. DeCew, resident engineer.

Many Contracts Awarded.

Other bridge contracts recently awarded provide for the following structures:

Three wooden bridges in Imperial County; three small structures in the California State Redwood Park; completion of the Truckee River bridge at Hinton; one culvert and two bridges on the Coast highway near San Ardo, Monterey County; concrete girder bridge across Auburn Ravine, Placer County; reinforced concrete arch bridge across Smith River on the Redwood highway, Del Norte County.

UNIFORM STANDS FOR RURAL MAIL BOXES HELP CLEAN UP ROADSIDE

THROUGHOUT the state maintenance forces are constantly endeavoring to clean up the roadsides in order that the state highways may present as neat and sightly an appearance as possible. Rural mail boxes projected to varying heights and affixed to all sizes and shapes of posts have been one of the worst problems along the right of way.

At points where there are a considerable number of these boxes, Division IV has evolved the plan of putting them all on one

UNIFORM RACKS FOR MAIL BOXES—Appearance of the roadside is being improved on state highways by building uniform height racks for rural mail boxes off the traveled way. The scene above is in Contra Costa County, Division IV.

stand of uniform height, as shown in the illustration. The placing of a small quantity of crushed rock on the driveway leading to the boxes, made it possible to move them back to the edge of the right of way, and was greatly appreciated by the rural carrier. He may now stop entirely off the paved part of the highway, free from moving traffic. Discarded guard rail lumber was used for building the stand.

Maintenance Engineer G. R. Winslow proposes that a similar plan be followed throughout the state, wherever five or more mail boxes may be placed together at a single location.

HIGHWAY NEWS NOTES

R. P. DUFFY, formerly maintenance superintendent for Division IV in Marin and Sonoma counties, has been promoted to the position held by H. W. Schreiber, resigned. Mr. Duffy is now in charge of all maintenance work in Division IV with headquarters in the division office at San Francisco.

N. D. Douglas has been placed in charge of the survey party which is running a new line around the San Juan grade in Division V, succeeding R. S. Badger, who has been assigned to other duties.

T. W. Voss, resident engineer, has been transferred from the Briceburg convict job to Division V.

A. R. McEwen is now resident engineer for Division IX on reconstruction work between Mojave and Little Lake.

Desert Foremen Have Picnic.

Maintenance foremen working on the National Old Trails highway, Division VIII, gathered at Newberry Springs on Sunday, May 30th for a get together and picnic. Swimming and dancing were enjoyed by the maintenance men and their families. Newberry Springs is a little oasis on the highway, the only one for many miles.

"Perhaps the most prolific source of accidental death to motorists is the grade crossing. In a few cases such crossings can not be removed without an unreasonable expenditure of money. The majority, however, will be eliminated from the nation's highways, while the scientific location of routes will make a complete abolition of grade crossings possible on the newly built roads."—*H. G. Shirley, Chairman, Virginia Highway Commission.*

STATE HIGHWAY FUND CONTRACTS (Bond Funds, Including Federal Aid)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE MAY 15, 1926.						
471	III	Nevada	38	A	Across Truckee River near Boca		Reinf. Concrete Arch Bridge	Rocca and Caletti	$33,964 88	June 17, 1925	
473	V	San Luis Obispo	2	E	At Pismo		Bridge and Overhead Crossing	J. L. Webster	58,346 65	June 17, 1925	
474	III	Nevada, Sierra	38	B-A	Floriston to Nevada State Line	5.96	Grading	Nevada Contracting Co.	333,821 25	June 17, 1925	
486	VI	Mariposa	18	G	Across Merced River ½ mile west of El Portal		Reinf. Concrete Girder Bridge	Otto Parlier	36,894 38	Oct. 23, 1925	
493	X	Yolo	6	C	Between Fifth St. in Washington and the M St. Bridge	0.25	Grading	H. V. Tucker Co	17,640 00	Feb. 8, 1926	
					AWARDED SINCE MAY 15, 1926.						
500	II	Lassen	28	A	Between 4 miles west of Bieber and Bieber	3.80	Grading and Gravel Surface	John F. Collins	$74,608 02	May 27, 1926	125
502	VIII	Imperial	26	H	Between Brawley and Westmoreland		Three Timber Bridges	Norman B. Conway	15,973 31	June 8, 1926	125
					Sub-total	3.80			$90,581 33		
					PENDING AWARD.						
	VIII	Imperial	26	H	Between Brawley and Westmoreland	6.46	Grading and Std. Surfacing		117,950 11		200
	VI	Fresno			At Fresno		Division Office Building		22,406 63		100
					Total State Highway Fund Contracts Awarded and Pending Award	10.26			$230,938 07		

NOTE.—Primary construction covered by the above contracts does not include funds obligated on cooperative forest highway projects, prison camp road activities or day labor jobs not being done under contract.

STATE HIGHWAY MAINTENANCE FUND CONTRACTS (Including Gasoline Tax Fund)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE MAY 15, 1926.						
M-85	VII	Los Angeles	2	D	Montebello to Whittier	3.47	P.C. Concrete Pavement	Kuhn Brothers	$184,821 77	June 3, 1925	
M-97	VII	Los Angeles	2	D	Philadelphia St. to Michigan Ave.	1.90	P.C. Concrete Pavement	J. Paul Benson	93,185 66	Aug. 14, 1925	
M-100	X	Sacramento	4	B	Sacramento to ½ mile south	0.47	Asphalt Concrete Pavement	A. Teichert and Son	22,680 56	Sept. 21, 1925	
					AWARDED SINCE MAY 15, 1926.						
M-128	IV	Santa Cruz	44	A	Btw. Boulder Creek and California Redwood Park		Reinf. Concrete Box Culverts	Noble Brothers	$16,687 12	June 8, 1926	125
M-129	III	Sacramento	3	B	Btw. Globe Iron Works and El Camino Ave.	1.14	Asphalt Concrete Pavement	Clark and Henery Const. Co.	32,443 88	June 8, 1926	125
M-130	VII	Orange	2	D	Across Santa Ana River, 2 miles north Santa Ana		Reinf. Concrete Girder Bridge	Charles and F. W. Steffgen	116,859 49	June 8, 1926	225
M-131	II	Modoc	28	C	Btw. Alturas and Royce Ranch	10.84	Grading and Std. Surfacing	J. P. Holland, Inc.	66,883 50	June 8, 1926	100
					Sub-total	11.98			$332,873 99		
					PENDING AWARD—None.						
					Total State Highway Maintenance Fund Contracts Awarded and Pending Award	11.98			$232,873 99		

NOTE.—The above obligations charged against the State Highway Maintenance Funds do not include funds from these sources obligated for general maintenance and for specific betterments being done under day labor authorization.

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CALIFORNIA HIGHWAYS

A BULLETIN ISSUED BY THE CALIFORNIA HIGHWAY COMMISSION FOR THE INFORMATION OF ITS EMPLOYEES AND THE PUBLIC

Vol. 3 JULY, 1926 No. 7

PACIFIC HIGHWAY ARCH—Bridge across Charley Creek in northern Shasta County. This structure, 120 feet from creek bed to bridge floor, shortens distance nearly a half mile and greatly improves alignment. Plans for two other similar structures have been completed by Bridge Department. (See article on page eleven.)

In this issue: NEW YOSEMITE HIGHWAY DEDICATED—PRACTICABILITY OF MAINTENANCE ON DESERT ROADS DEMONSTRATED.

CALIFORNIA HIGHWAYS

HARVEY M. TOY, Chairman;

N. T. EDWARDS and LOUIS EVERDING, Commissioners.

ROBERT M. MORTON, State Highway Engineer.

W. F. MIXON, Secretary.

We are pleased to permit publication of any of the matter contained herein or to loan cuts, and this privilege is extended newspapers and periodicals without restrictions.

FRANK B. DURKEE - - - Editor

P. O. Box 1103, Sacramento, California.

Vol. 3 JULY, 1926. No. 7

CALIFORNIA HIGHWAY DEPARTMENT

FRIEND WM. RICHARDSON, Governor.

CALIFORNIA HIGHWAY COMMISSION

HARVEY M. TOY, Chairman, San Francisco

N. T. EDWARDS, Commissioner, Orange

LOUIS EVERDING, Commissioner, Arcata

R. M. MORTON, State Highway Engineer, Sacramento

PAUL F. FRATESSA, Attorney, San Francisco

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C. L. McKESSON, Materials and Research Engineer

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E. Q. SULLIVAN, Division VIII, San Bernardino

F. G. SOMNER, Division IX, Bishop

R. E. PIERCE (Acting), Division X, Sacramento

General Headquarters, Fifth Floor, Forum Bldg., Sacramento

WITHOUT minimizing the importance of the work of the various other departments, the Maintenance Department is the one on which we depend to keep us out of trouble. Whether it be for the repair of natural disintegration, remedying inadequate construction, or meeting an extraordinary emergency caused by floods or washouts, the maintenance man must be always on the job—in fact, he must be a little ahead of the job.

Unlimited opportunity exists for the exercise of ingenuity by the maintenance employees. Road building standards are in a gradual state of change. Amount of traffic and weight of loads are not stabilized. The analysis of conditions that cause heavy maintenance expense and suggesting the remedy therefor is strictly within the province of the maintenance man.

The maintenance man must not only repair deterioration, but he should keep constantly in mind the safety features of the highways. The public rightfully expects uniform, safe maintenance of State highways. The life of the motorist who is accustomed to a safe standard of maintenance in one section of the State is far more dependent than we sometimes realize on that same safe standard being found on all State highways.

Must Be Ever Vigilant.

It should be the personal creed of every employee of the Maintenance Department that nothing of an unsafe nature is left overnight as an obstruction on a highway. High rates of speed and an assumption of safety are induced by good maintenance.

(Continued on page 6.)

EVERY employee of the highway commission has a direct interest in the improvement of the highway organization's methods and results, both engineering and clerical, office and field. To that end, the State Highway Engineer invites constructive criticism or suggestions from every employee.

Ideas as to the more economical and efficient handling of your job, or suggestions for elimination of waste will be welcomed. Criticism is also desired from persons outside the organization, who are in a position to give facts.

Send only signed communications addressed as follows: California Highways, P. O. Box 1103, Sacramento, Cal.

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JULY 1926

California Highways

VOL. 3 No. 7

Federal Aid Victory Insures National Progress

PASSAGE by congress of the federal aid appropriation, which was recently approved by the President, means the continuation, unhampered, of the American road building program. Few things will make a greater contribution in the immediate future to the progress, prosperity, and solidarity of the nation. With this encouragement from the federal government the states will carry on construction of that great system of national highways first definitely established under the Highway Act of 1921.

Continuation of this wise policy of state and federal cooperation in highway building, although overwhelmingly supported in congress and generally favored by the people, was not accomplished without a nation-wide campaign by its supporters. The appropriation of $75,000,000 for each of the fiscal years 1928 and 1929 was strenuously opposed in the senate by a small group of eastern men who threatened a filibuster and who, apparently, from a national point of view, have no conception of the importance of highways.

Their rich constituencies are able, they assert, to build their own highways and for those beyond the borders of their states they have no concern. The need and desirability of continuous trunk highways, binding together all sections of the country, bringing the citizenship closer together, and providing, also, for the national defense, means nothing to them.

The West, whose great natural resources contribute annually to the wealth of the East, has ever been alert to the necessity of highway construction as a means of development. Alarmed by the growing hostility of certain eastern interests, the western states, in the face of the cry of sectionalism, began the campaign that rallied the friends of federal aid from every state in the union. Never before in the history of this legislation, reported Congressman Dowell, did an appropriation have such unanimous support as was accorded the 1926 federal aid bill.

The State of California will receive from this appropriation approximately $2,500,000 a year, a small share of what the state undoubtedly will expend for highway during the same period. California eventually could complete her highway system without additional federal aid, but she recognizes that progress in other western states, where great areas are still in federal ownership, would stop almost altogether without the helping hand of the national government; the continuity of the whole highway building program of the country, of far greater importance than actual cash contributions from Washington, would be destroyed.

The California Highway Commission is proud to have had a part in bringing about favorable action by the congress. In the dark hours when some went so far as to predict an overthrow of the federal aid policy by the recently adjourned congress, Chairman Harvey M. Toy, by personal appeal to civic organizations, governors, highway officials, congressmen, and senators, urged united action by the western commonwealths. The warning from the west found willing workers beyond the Rockies, who convinced congress that the great majority of the people of all classes throughout the country desired continuation of federal aid for roads. Eventually there came to its support the American Association of State Highway Officials, American Automobile Association, American Bankers Association, American Farm Bureau Federation, American Federation of Labor, National Grange, American Road Builders Association, National Automobile Chamber of Commerce, and the Chamber of Commerce of the United States.

It is to be hoped that the wisdom of federal aid or the attitude of the people will not again be questioned until an improved highway connects every community in every state of the union.

New Highway Opens Yosemite To All-year Motor Travel

A DREAM come true—incomparable Yosemite, the supreme of Nature's handiwork in California, easily accessible by automobile at all seasons of the year. This thought will be uppermost in the minds of the state's motorists on July 31st, when Governor Friend Wm. Richardson formally opens to travel the Merced canyon highway from Briceburg to El Portal. He will dedicate not only a highway destined to be traveled by countless thousands, but also a memorial to the California plan for "building men and roads." The highway is a monument to the engineers who conceived it and to the prisoners from San Quentin and Folsom prisons, who contributed the greater part of the labor that created it. It is one of the outstanding convict-built roads of the country.

Second Bond Issue Road.

Ever since the automobile came into general use, the people of California have desired a better highway than existing roads over the rim as a means of reaching Yosemite Valley. The legislature proposed to meet this demand by providing, in the second bond issue of 1915, for an extension of the Merced-Mariposa county seat lateral from Mariposa to El Portal by way of Merced Canyon.

When the present highway commission took office in 1923 it found some work authorized on this project, which would complete the road as far as Briceburg on the Merced River, 16.5 miles from El Portal. The commission viewed a Yosemite entrance as the major recreational highway of California, an attitude concurred in by the Governor, and despite heavy grading necessary throughout most of the canyon, immediate construction was deemed justified.

Trial of New Pay Law.

The project also was believed ideal for a thorough trial of the new convict pay law which had been passed by the 1923 session of the legislature; accordingly the first camp of San Quentin prisoners was established at Briceburg in November of 1923.

Later, in December of 1925, a second camp of Folsom prisoners was put to work at the El Portal end; grading operations were continued from both directions until the two crews met, when the camps were consolidated at the South Fork. A crew will be continued at the latter point until considerable surfacing has been completed.

W. B. Albertson has been superintendent of the San Quentin camp throughout the operations and since the consolidation of the Folsom camp with his, he has had charge of both crews.

(Continued on page 5.)

PRISONERS COMPLETE ENTRANCE TO NATIONAL PARK

IN MERCED CANYON—Views in Merced River canyon on new Briceburg-El Portal section of the Yosemite lateral which opens Yosemite Valley to motor travel at all seasons of the year. *Upper right,* Yosemite Falls, world's highest water fall, an objective of the new road; *Lower, left,* old court house at Mariposa, landmark on the highway into the park; *Lower right,* scene at South Fork prison camp after work for the day is over.

GOVERNOR DEDICATES MERCED CANYON ROAD

(Continued from page 3.)

During the period of construction the average number of prisoners employed was over 200, together with an average of some twenty or more free men. Eight hundred prisoners have been sent to the project, of which number approximately 500 have been discharged or paroled during the progress of the work. After charges authorized by the law are deducted, net earnings of prisoners employed on the Yosemite highway to date total approximately $59,000, of which $20,000 has been allotted to dependents. The average net earnings per man per day has been about 31 cents. At present about 170 prisoners are on the job.

Before construction began a thorough study was made of the Merced canyon by engineers of Division VI and representatives of headquarters. A previous survey had been run on a location high up the slopes of the canyon away from the river. This line was abandoned for one near the water, more desirable from

the point of view of the motorist and less expensive because of reduced yardage to be moved.

High Standards Prevail.

A roadway of high standards has been literally blasted from the rocky walls of the canyon. The roadbed has a minimum width of twenty-six feet and in many places is much wider. In the entire section of 16.5 miles, from Briceburg to El Portal, there are only three curves with a radius of less than 500 feet. The prevailing grade varies from 1 to 2 per cent; the steepest pitch on the whole section is a few feet of 4.58 per cent grade beyond Sweetwater Creek. There are, of course, steeper grades on the sections between the San Joaquin Valley and Mariposa, built a number of years ago, and between Mariposa and Briceburg, but all are within 7 per cent and may be made in high gear by almost any make of car. The different sections demonstrate the increasing standards of State highway construction.

Approximately 1,000,000 cubic yards of earth and rock have been moved on the Briceburg job. In addition a crushed rock surfacing, four inches thick and twenty feet wide, has been applied. Five bridges have been necessary across Bear Creek, Slate Gulch, Sweetwater Creek, South Fork and Merced River. The grading, the surfacing, and the bridges represent an expenditure of approximately $1,200,000.

Macadam Pavement Planned for Next Year.

Additional funds to the amount of about $112,000 are being held in trust in San Francisco to finance paving. The money was raised in 1919 by automobile clubs and civic organizations by the sale of automobile permits to enter Yosemite Park, under an agreement with the Secretary of the Interior that the money would be held until the State completed the grading. It is proposed to use this fund next spring to defray the cost of placing an oil macadam surfacing on the Merced canyon section. Prisoners to be retained at South Fork will be engaged during the winter in the production of the necessary crushed rock.

The highest point on the Merced-El Portal lateral is at Bear Creek summit which the highway crosses at an elevation of 2974 feet as compared with an elevation of more than 6,000 feet on other entrance roads to the Valley. The elevation at El Portal is 1924 feet.

It is a happy coincidence that the dawn of all-season motor transportation for Yosemite Valley comes almost to the day of the seventy-fifth anniversary of the discovery of the Valley by the Mariposa Battalion. Dedication of the highway will be the opening event of Yosemite's two-day Diamond Jubilee celebration. National and State leaders will participate in the ceremonies and the speaking program will take place at the Clark Ranch near Mariposa on the morning of July 31st.

Chairman Harvey M. Toy of the California Highway Commission will be introduced as chairman of the day by Richard Shaffer of Merced. Governor Friend W. Richardson will make the principal address. Others invited to participate are:

Julian H. Alco, State Prison Director; Nelson T. Edwards of Orange, Highway Commissioner; Dr. L. I. Hewes, Chief of Western Division, United States Bureau of Public Roads; Henry W. Keller, President, Automobile Club of Southern California; Stephen T. Mather, Director National Park Service, Washington, D. C.; R. M. Morton, State Highway Engineer; H. B. Show, District Forester, United States Forest Service; H. J. Brunnier, Chairman Good Roads Committee, California State Automobile Association.

At the conclusion of the dedicatory exercises, the assembled officials will lead a motor caravan over the new highway from the Clark Ranch to Yosemite Valley. En route, two brief stops will be made at Briceburg and El Portal, where it is proposed to dedicate bronze plaques to the convicts from San Quentin and Folsom prisons, whose toil has made Yosemite Valley an all-year motorland, available to the nation.

Widening on Yosemite lateral in vicinity of King Solomon Mine, Mariposa County. Material between dotted line and bank was removed to widen curve and improve safety of highway. Work done by maintenance forces of Division VI.

RECONSTRUCTED PAVEMENT CONNECTS ONTARIO AND RIVERSIDE

ONTARIO TO RIVERSIDE—Reconstruction of state highway between Ontario and Riverside, Riverside County, has been completed by Division VIII. *Upper,* condition of old fifteen-foot base prior to placing of new surfacing; *Below,* work under way; *Right,* new twenty-foot asphaltic concrete pavement with graded shoulders.

"STRAIGHT FROM THE CHIEF"

(Continued from page 2.)

The possibility of saving time is a financial asset to the road user, and is a part of his return for the tax money which he pays for State highways. An unexpectedly encountered obstruction, whether it be a fallen branch from an overhanging tree, an excavated pavement, or a section of rough going, threatens the life and property of the motorist, especially in night driving.

The standing of the Maintenance Department with the public as an efficient organization is affected by the quality of the maintenance performed on the highways. Its position as an efficient branch of the State Highway organization is best effected by the evolution of better methods and reduction of costs.

Any amateur can take some one else's money and accomplish a desired result. The real accomplishment is to set a high-class result at small cost. This is the problem the maintenance engineers and foremen on the California State highways are wrestling with, and we want the balance of the organization and the public to give them full credit for their many accomplishments.

MAINTENANCE WORK PLEASES

MAINTENANCE work on all unconstructed state highways, which became general throughout the state on January 1st of this year in accordance with an act of the 1925 legislature, already has resulted in the improvement of many miles of county road. It is the purpose of the commission to improve traffic conditions until such time as final location and construction can be undertaken.

Among the roads taken over by the commission on a designated state highway route was the county road from Middletown to Lower Lake, Lake County.

C. C. Donovan, well known citizen of Santa Rosa, writing to Chairman Harvey M. Toy, has this to say of what has been accomplished on this road by Division I:

> Allow me to congratulate and thank you for the work now going on in improving the Middletown-Lower Lake road.
>
> The straightening out of the dangerous curves on that road will, I think, prevent many accidents with the coming traffic on the completion of the Carquinez Bridge next March.
>
> Every tourist going into Lake County over that road will be grateful to you for the work now being carried out.

DELIVERING CONCRETE MIX AT TWENTY MILES PER HOUR

TO EXPEDITE the work and cheapen the cost, Gutleben Brothers, contractors for the State on the Rio Hondo Bridge on Whittier boulevard, Los Angeles County, have constructed a novel motorized outfit for delivering concrete mix.

A second-hand Ford automobile with the wheels and body removed was fitted with flanged wheels for operation on an industrial railroad. A riveted sheet steel hopper takes the place of the body for carrying the concrete. The mixer dumps directly into the hopper and the driver steps on the throttle and the load is quickly delivered to its destination on the bridge.

A lever near the driver's seat makes it possible to release the mix on either side of the hopper as desired. The speed at which a load of fresh concrete may be delivered makes the apparatus very effective, in the opinion of the contractors.

WORK OF DIVISION VIII DEMONSTRATES PRACTICABILITY OF ECONOMICAL MAINTENANCE OF DESERT ROADS

THE FOUR major interstate connections of southern California—El Centro to Yuma, Mecca-Blythe highway, National Old Trails, Barstow to Topoc, and the Silver Lake cut-off—reach the state's eastern border after traversing many miles of desert country. A fifth, the trunk highway east of the Sierra, extending from Mojave to Owens Valley and beyond, also crosses many miles of sandy wastes. Increasing transcontinental travel demanded improvement of these desert trails, but little was attempted by the State until after the present commission took office in 1923.

In justice to users of the interstate connections, it was decided that at least maintenance should be undertaken. The first step in this program was to relieve Division VII of the burden of the desert roads and to set up a new division with headquarters in San Bernardino. To this new organization, designated Division VIII, was transferred all state highway work in San Bernardino, Riverside and Imperial counties, and a study of desert road conditions at once undertaken.

Maintenance Program Authorized.

A program of maintenance was authorized to improve as quickly as possible traffic conditions throughout the length of the desert roads. In many instances it was evident maintenance could with advantage be undertaken over the surveyed location of the highway, and wherever this was possible the winding desert trails were abandoned for the more direct and shorter routes.

Tractors, trucks, scrapers, and drags comprise the bulk of the equipment in use. With the exception of the Silver Lake cut-off, which was added to the highway system in 1925 by legislative act, work on the desert roads was fairly well under way in 1924 and up to the present time excellent progress has been made. It was found the bugaboo of the desert, that had prevented construction because of a lack of large amounts of money for permanent improvements, was largely a myth. Remarkable changes were

DESERT LINE CHANGE—Old road wanders to left, new road cuts distance by direct line across the wastes. Maintenance work by Division VIII near Ludlow.

wrought in a comparatively short time with an expenditure of a few hundreds of dollars per mile.

Maintenance Becomes Construction.

Running time for a motor trip across the desert was greatly reduced and in some instances cut almost in half, while the discomforts as far as rough roads were concerned were largely removed. Constant dragging with placing of some rock surfacing on the most sandy section was the plan followed by the Division. Where the work is being done on final locations, this form of maintenance in a few years will provide a completely graded and surfaced highway at a minimum of expenditure.

The work has been facilitated by the loyalty of the maintenance foreman and crews sent to work in these distant and uninhabited sections, where heat and lack of water are only some of the difficulties to be encountered. It has been necessary to so do the work that the dragging would produce a surface without rain or artificial sprinkling to pack the road. To determine the best means to this end has required much patient study and experimentation.

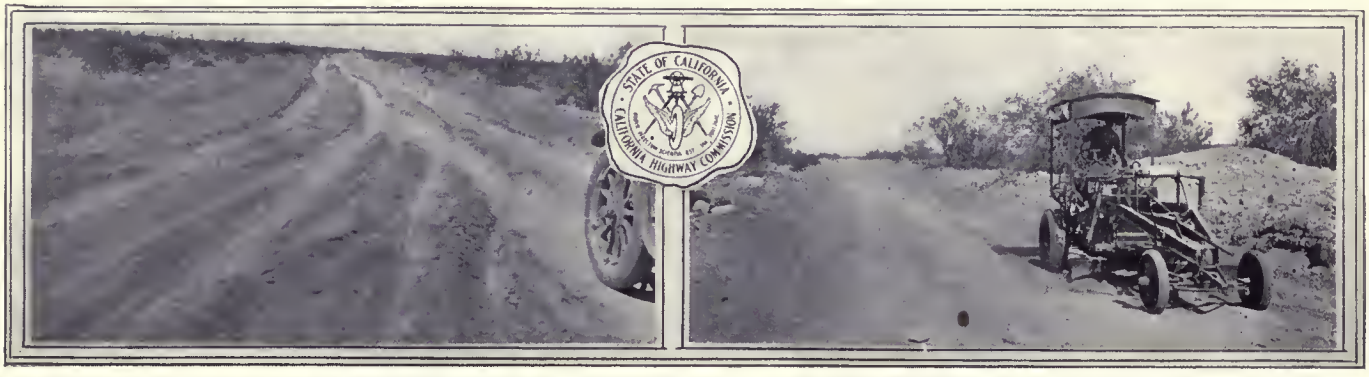
Many users of the highway familiar with past road conditions on the desert have not hesitated to commend in highest terms

MECCA-BLYTHE HIGHWAY—Before and after state maintenance in Box Canyon east of Mecca, Division VIII.

what has been accomplished. Recently there was added to these words of approval of the course followed by the commission, the testimony of Phil Townsend Hanna, the well known editor of *Western Highways Builder*. After a trip over some of the Division VIII desert roads, he writes as follows:

> Keeping everlastingly at it, some sage once remarked, brings success. Keeping everlastingly at maintenance, to paraphrase this aphorism, is the secret of the satisfactory road. No road, regardless of type, will long endure without continuous maintenance. Maintenance, of course, varies in intensity in inverse ratio to the quality of the road. Hard-surfaced roads require less than gravel-surfaced highways and gravel-surfaced less than natural earth roads. But no type escapes the necessity for constant repair and conditioning.
>
> Customarily, maintenance follows construction, but occasionally it precedes construction and, even less frequently, it becomes a construction operation. Such is the case of what is known colloquially in southern California as the Silver Lake, or Arrowhead Trail cut-off. This road is an important link in the Arrowhead Trail, stretching from Daggett, in the center of San Bernardino County, to the California-Nevada State line, south of Jean, Nevada. * * * The road was added to the state highway system by a legislative act of 1925 and maintenance operations started in November of the same year.
>
> E. Q. Sullivan, division engineer of the California Highway Commission at San Bernardino, under whose jurisdiction the maintenance work is performed, found many discouraging obstacles when work was started. For its length of practically 108 miles, the cut-off was virtually uninhabited. It crossed the northern end of the Colorado desert, the heat from which complicated the labor problem and necessitated the installation of complete motor-driven equipment.
>
> San Bernardino County had expended more than $35,000 to make a passable road of the cut-off when the State took over the work, but it was little more than two rutted wheel

INTERSTATE CONNECTIONS BENEFIT UNDER NEW POLICY



DESERT MAINTENANCE—Before and after scenes on a section of desert road in Division VIII.

tracks across the desert, the mesas and the mountains. Soil conditions varied along the route from fine sand to rough volcanic rock and malapai. The topography of the country, however, is rolling and the problem of gradients was reduced to a minimum, despite the fact that the road varies from 900 to 4700 feet in elevation. The chief difficulty confronting the maintenance crews was the elimination of unnecessarily sharp curvature and the development of ways and means of improving the surface.

Equipment Employed.

When maintenance started, 15 men were employed, operating one Best 60 tractor in combination with a 12-foot Adams leaning wheel grader; three Spearwell Big 8 one-man maintainers, McCormick-Deering powered; two 2-ton Holt tractor-Fresno combinations and sufficient trucks and small equipment. Camp was established at Baker, on the Tonopah and Tidewater Railroad, approximately halfway across the project, and operations were started in both directions from the camp. Heavy grading was accomplished with the Best-Adams outfit and the Holt-driven Fresnos, and light grading with the Spearwell maintainers, the latter averaging upward of 20 miles of work each day.

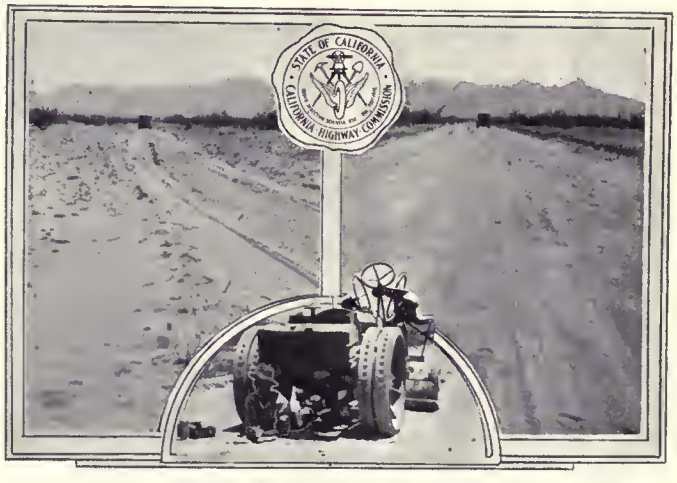
Experiments Demonstrate Best Methods.

The light sandy stretches provided cause for experimentation. For several weeks maintenance forces found it necessary from time to time to snag cars that had become stalled in the sand. Experimentation revealed a rather simple but interesting solution for this problem. The entire roadway was ploughed to a depth of a few inches and then dragged with a light drag. This had the effect of hardening the entire roadway and provided adequate traction.

Traffic over the cut-off has averaged approximately 150 cars a day but as this is written, the summer touring season is opening and vehicles employing the road are rapidly multiplying. The maintenance crew, therefore, is being augmented considerably. It is six months since maintenance on the cut-off started and today it is veritably a boulevard. Motorists travel from Barstow, California, to Las Vegas, Nevada, a total distance of 160 miles, in six hours with ease and many have gone over the road in 5 hours. When the Committee of Nine, authorized by the Legislature, made an inspection trip over the road a year and a half ago, they required an entire day to negotiate the same distance and were forced to carry provisions, adequate supplies of water, gasoline and oil, for there were no filling stations or sources of supply over the entire road. Now filling stations and provisions may be obtained every few miles and the trip is a mere jaunt. All of which is directly traceable to the efficient maintenance that has been done.

Economy Features Work.

As remarkable as any phase of the work, has been the economy with which it has been conducted. When the State took over the route for maintenance, the highway commission made an annual appropriation of $100,000, of which $50,000 was to be spent on maintenance and $50,000 for improvement. On May 1, some six months after work started, a total of but $17,400 had been spent on the road. Of this sum, 90 per cent was employed on the 70 miles immediately west of the Nevada State line, thus putting this section in first-class shape at an average mile cost of about $233. The remaining section of the road has been worked over once or twice and will be subjected to intensive maintenance for the next few months, but even so, it is believed that the cost of maintenance and improvement will fall far below the estimate.



ON THE DESERT—Work of Division VIII on National Old Trails. Views show condition before and after road was taken over by state. *Insert*, tractor operator crawls under machine to eat lunch, the only shade for miles around.

DESERT HIGHWAY WORK PRAISED

State Highway Commissioner N. T. Edwards is in receipt of a communication from H. A. Lake, prominent Garden Grove man, complimenting the commission on the excellent condition of the desert highway in San Bernardino County.

Lake states that his party made the tour from Garden Grove to Kingsman, Arizona, a total distance of 356 miles in ten hours.

This road leaves San Bernardino via the Cajon Pass and then proceeds through Victorville, Barstow and Needles.

Lake writes: "The highway is extra fine."—Orange *News*.

Some men are successful chiefly because they didn't have the advantages others had.—*Columbia Record.*

First try your hand at something, and if you fail try both hands. Then, if unsuccessful, try using your head.—*Pure Oil News.*

OILING MAY SOLVE DUST PROBLEM ON UNPAVED HIGHWAYS

OILING of a considerable mileage of earth and rock surfaced highways has been under way by maintenance forces throughout the state during the present Summer. The object of oiling the state highways is dust prevention, while in some sections it is taking on the added characteristics of an oil macadam surfacing. In all instances a fuel oil is being used.

Oiling is being done on highways in Imperial Valley and other sections of Division VIII, on the Redwood and Pacific highways, in Divisions I and II, and also on unpaved highways of Divisions III, IV, V, VI, IX, and X. Reports from various parts of the state indicate success but it will be some time before a final estimate of results of the Summer's work can be made.

On most of the mountain roads applications have been light and have been made as a dust palliative only. More permanent work is being done on sections of the Pacific Highway, in Shasta and Siskiyou counties, and also on the Redwood Highway in Mendocino and Humboldt counties. On the latter routes, which already have been surfaced with crushed rock, larger applications of oil are being made for the purpose of forming a bonded surface.

Applications Vary With Conditions.

The amount of oil applied varies with the purpose in view and the condition of the road. Where the rock surface has been packed firmly, it is swept clean of dust and an oil of 60 to 65 per cent asphalt is applied under pressure in two applications of 0.25 of a gallon each per square yard. The oil thus applied is allowed to penetrate downward into the road and is not absorbed on the surface by application of additional rock. When necessary it is heated before application. The purpose of permitting the oil to seep into the road is the formation of an asphaltic bond.

Where the use of the oil is as a dust palliative only, the highway is not swept, the oil being applied directly on the road surface at the rate of one-tenth to one-seventh of a gallon per square yard. An oil of 40 to 45 per cent asphalt is applied under pressure without heating and the quantity used is varied according to the amount of dust. Oil thus applied gives body to the dust the same as water sprinkling but it is much more durable.

There is every reason to believe that the new plan will prove cheaper than applications of calcium chloride or sprinkling with water and much more satisfactory. It is evident, too, that the plan is meeting with hearty approval upon the part of the public. Except in a few instances where traffic has followed immediately after the application of the oil, there has been no inconvenience to motorists.

Conditions Commended.

Among comments received from users of the highways is the following letter from Frank A. Kent, of Stockton, Secretary of the American River Summer Home Association. Writing to Division Engineer F. W. Haselwood, he says:

I have just returned from a trip over the Placerville road to Lake Tahoe, coming down through the heavy travel the last week end.

While up the Canyon, I had the opportunity of interviewing quite a number of those using the road, and they were loud in their praise of the work of the Highway Commission in oiling the road. It is a wonderful piece of work, and has certainly added immensely to the comfort of the trip. We have been informed that it is contemplated giving the road a second treatment of oil sometime during July.

As we are called upon frequently to register complaints, it is indeed a pleasure to be able to write something more pleasant. I am sure that those who are responsible for securing this oil are entitled to the thanks of every person traveling the road.

We are hoping that this good work will continue, and if there is any place along the way where we can be of service to you, do not hesitate to call upon us.

Lake Supervisor Comments.

The following has been received by Chairman Harvey M. Toy from Supervisor T. A. Read of Middletown, Lake County.

"I wish to thank you and the other members of the Highway Commission for the splendid work you had done in oiling the street in Middletown.

"I know I express the appreciation of the entire community as well as the traveling public for this work. Before it was done the dust was almost unbearable."

Protects Adjacent Orchards.

Prevention of dust is of value not only to users of the highways but to adjacent property owners as well. Particularly is this true where the roads are adjacent to fruit orchards and vegetable gardens. A letter to Division III from James Mills, Jr., manager of the large Mills Orchard properties at Hamilton City, Glenn County, expresses this point of view. The letter reads as follows:

"The splendid work done in the oiling of the Chico-Orland highway through our property has been of great benefit to us in holding down the dust and thus keeping our orchards in good shape, and we wish to take this opportunity of thanking you for your very prompt attention to the matter."

Sufficient funds to carry on this type of maintenance were not available prior to 1923 when the two-cent gasoline tax law was signed by Governor Friend Wm. Richardson.

Effective Method.

"Black boy, whut yo' all runnin' fo'?"
"I'se gwine to stop a fight."
"Who all's fightin'?"
"Jes me an' anothah niggah."

PISMO OVERHEAD—Grade separation over Southern Pacific Railroad on Coast highway at Pismo Beach, San Luis Obispo County, showing new highway location which eliminates dangerous curves. New highway now open to traffic.

COMMISSION HELPS FARMERS FIGHT SPREAD OF PUNCTURE VINE

IN ALL parts of the state maintenance forces of the California Highway Commission are aiding farmers in an effort to control weed pests along the right of way. In recent months these efforts have been centered upon an attempt to stop the spread of puncture vine. Several methods have been tried but spraying with oil rather than cultivation seems to be the most effective.

Puncture vine spraying outfit, Division III, Glenn County. Maintenance of state highways includes assistance to agriculture by eradication of weed pests on the highway right of way.

The following letter comments upon the work of a Maintenance Superintendent of Division X:

F. B. McKEVITT COMPANY
Growers and Shippers
Vacaville, California,
July 8, 1926

California Highway Commission,
Sacramento, California.

Gentlemen:

I wish to take this opportunity of commending your Mr. Caine for the very efficient measures he used in treating the puncture vine which he found on the highway two miles southwest of Vacaville. He has been very active in looking for the puncture vine and is doing a very common sense job in cleaning it out.

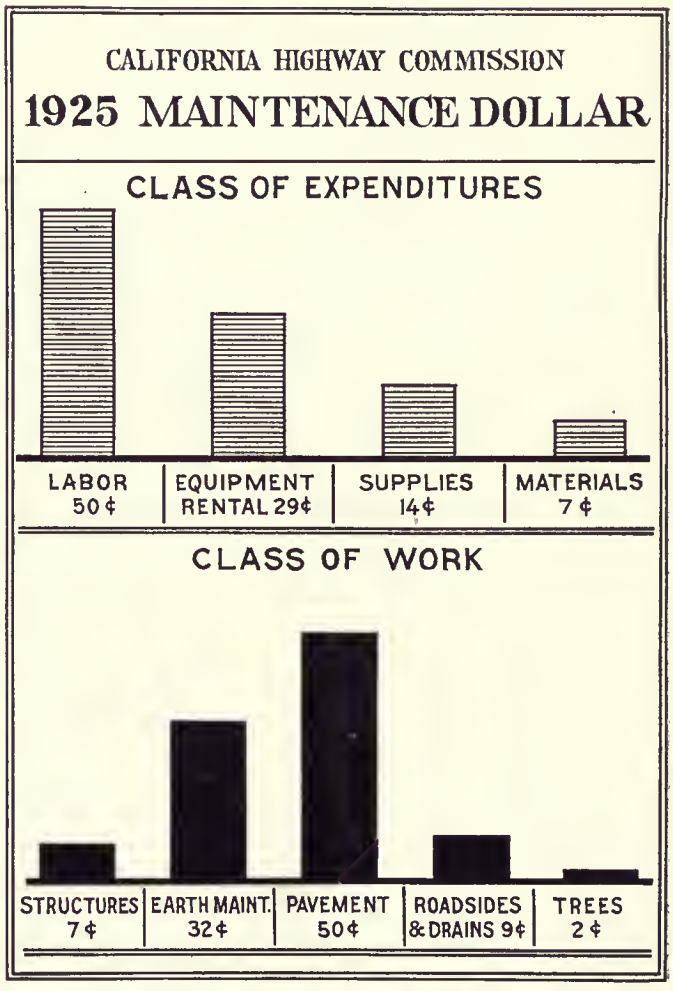
* * * * * * *

We want to thank your department for the interest that you are taking. Would like to suggest that a record be kept of the location of any cases of puncture vine so that this ground can be more readily inspected in the early summer of 1927 and the oiling done before the formation of the burrs, should any of the plants come back.

Thanking you for your efforts, I remain,

Yours truly,
F. B. McKEVITT, Jr.

RIDGE ROUTE LINE CHANGE—Callahan line change as it looks today. New line eliminating curves has been paved with oiled macadam. Photo by Division VII.



A GRAPH which will give the public an idea of how the Commission expends maintenance funds on the State highway has been prepared by the Maintenance Department, covering the work of this character done throughout the State for the year 1925. An original graph showing expenditures for Division III was submitted by that division and was revised to cover maintenance for the State as a whole.

Details of Classifications.

The department gives the following explanation of the character of expenditures included within each of the classifications:

STRUCTURES—includes all work incident to the upkeep and restoration of walls, culverts, bridges, guard rails, fences and signs, also the minor additions thereto.

EARTH MAINTENANCE—includes the regrading and shaping of shoulders and roadsides of paved roads and the regrading and shaping of any portion of the width of unpaved roads, also the removal of slides.

PAVEMENT—includes all work connected with the upkeep and restoration of pavements, and of the surface for the width of the traveled way on unpaved roads. The application of dust preventives is included in this item.

ROADSIDES AND DRAINS—relates particularly to the clearing and cleaning of roadsides and water ways, the removal and destruction of noxious weeds, the trimming of trees and brush to give greater vision, etc.

TREES—relates particularly to the trees which have been planted upon the State highways for the purposes of shade and ornamentation. It includes planting, watering, cultivating, trimming and all other work incident to the care and preservation of such trees.

HIGH ARCH BRIDGES PART OF PACIFIC HIGHWAY RELOCATION

RELOCATION of the State highway through the Sacramento canyon in northern Shasta County includes the building of four major bridges, three of which will be of the arch type. One of these, the Charley Creek arch, has been completed; a second, at Doney Creek, is under way, while a third at Dog Creek is about ready for contract. All three arches span deep canyons where considerable saving in distance is being made with decided improvement in alignment and grade. Reinforced concrete is the material being used.

The new structure at Charley Creek, now open to traffic, saves a half mile of six per cent grade and eliminates seven sharp and dangerous curves. Four approach spans at either end and two eight-foot pilasters lead up to the central feature, a 147-foot spandrel arch, at present the highest on the State highway system. The distance from the creek bed to the roadway of the bridge is 120 feet. The total length is 394.5 feet.

Resident Engineer Describes Construction.

The depth of the canyon and the steepness of its slopes make the Charley Creek location ideal for a structure of the arch type, says Resident Engineer W. H. Johnson, of the Bridge Department, who tells of construction details, as follows:

> Charley Creek is a small stream and the flow of water did not interfere with the erection or maintenance of the arch centering. The contractors were successful in designing and constructing a light falsework which was carried up in 20-foot bents, at 14-foot centers, 4" x 6" caps and posts being used. At the bottom of each bent 2" x 6" scabs were nailed on each side to take up some of the thrust and hold the posts in place. Cables attached to each side at the top of the false work held it rigid while pouring of concrete was taking place.
>
> In order that no unequal strain would be thrown on any part of the structure, care was taken to pour the fresh concrete to the same elevation at both sides and ends of the arch. The false work was built to provide for an estimated settlement of two inches, and when the centering was struck the arch crown was on exactly the plan elevation.
>
> For finishing the structure, a mixture of one part of fine sand, two parts of cement, and an amount of calcium chloride equal to five per cent of the cement was mixed with water and used as a paint on the exterior. After this application had set, which took from a few hours to several days according to weather conditions, the brush coat was dampened and rubbed with a carborundum stone until it lathered and filled the air pockets. It was then brushed out with a wet brush to a smooth surface.
>
> The contractors also took great care to keep the lines true and the forms well tied. There was no bulging of forms. The concrete also tested well. Deck concrete, Class "A" (six sacks of cement per cubic yard), averaged 3586 pounds per square inch; abutment concrete, Class "B" (five sacks of cement per cubic yard), averaged 2530 pounds per square inch, while that in arches and columns, Class "F" (seven sacks of cement per cubic yard), averaged 4650 pounds per square inch.
>
> Workmanship throughout was of high order and the result insures a lasting and beautiful structure. The neat finish of the long columns, the arched facia beams, and the great, high arch will make the Charley Creek bridge one of the attractive features of the reconstruction of the Pacific Highway.
>
> Harlan D. Miller, bridge engineer, had general direction for the State. Bordwell and Zimmerman of Napa were the contractors.

RESULTS ON NORTHERN ROADS SHOW WISDOM OF STATE MAINTENANCE

(From the Redding Courier Free Press.)

THE ROAD from Redding to Fall River Mills, a portion of the Redding-Alturas lateral, and the road from Redding to Weaverville were never in better shape than they are right now.

The State Highway Commission took over these roads so far as maintenance is concerned on January 1st, last.

The roads are now so well surfaced that they are but little inferior to the paved portions of the state highway.

The condition of these laterals is striking evidence of the wisdom of placing road construction and maintenance in the hands of engineers who know how. In years past, when all the country roads were in the hands of the county officials, those placed in charge of overseeing roads were good citizens, of course, and well meaning citizens, too, but they knew little of the engineering of road construction and maintenance. Thousands of dollars were thrown away, as everybody knows, but now that the work is in the hands of the State Highway Commission and its engineers, road building and road repairs have been made to endure and the work has been done in a know-how way.

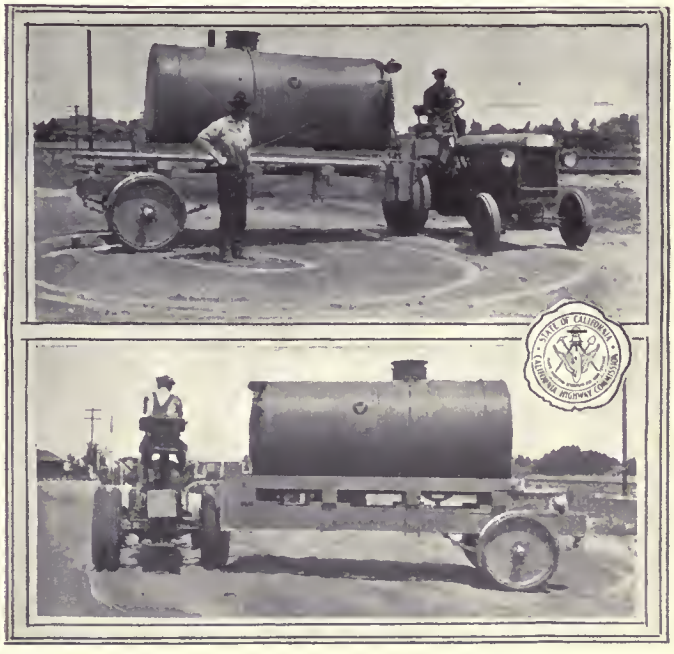
H. S. Comly, Division Engineer of the second division of the state highway, has an able body of road builders at his command, as judged by the work that has been done in and around Redding, and it is also true that the fine condition of the Weaverville and Alturas laterals is largely due to his management.

NEW TREE WATERING OUTFIT OF DIVISION VI CUTS COSTS

RENTAL of equipment used for watering roadside trees has been reduced 50 per cent, Division VI reports, by the use of a tank trailer hauled by a McCormick-Deering tractor. The new equipment is now in use on the 17-mile section south of Bakersfield, where trees planted under desert conditions require much water during Summer months.

The new equipment replaces two Packard trucks which accounts for the big saving in rentals. The tank-trailer also has the further advantage of a short turning radius as shown in the illustration. It can be turned around in a space of 17 feet.

The outfit is equipped with lights and the sides also are illuminated at night when turning for the prevention of accidents. During the season when watering is not necessary, the tank may be removed from the trailer permitting its use for other purposes.



Division VI tree watering outfit which has cut cost of this work. Water tank can be removed and trailer used for other purposes during winter.

WHAT THE DIVISIONS ARE DOING

STATE MAINTENANCE ON REDWOOD ROUTE BENEFITS TRAFFIC

BY AUGUST 1st maintenance crews of Division I expect to have finished the improvement of nearly thirty miles of unconstructed highway on Route I in northern Humboldt and southern Del Norte counties. The work, which has been under way for over two months, consists of widening the existing county road at curves and the construction of additional turnouts.

The old road, inadequate for the rapidly increasing traffic of the redwood country, has been extensively improved under the new policy of State maintenance, which was authorized by the last legislature. On the section mentioned more than 100 blind curves, formerly too narrow for machines to pass, have been widened to 20 and 30 feet. Additional turnouts to the number of more than 100 have been built so that for a considerable portion of the distance a two-way road has been provided.

Small Shovels Prove Effective.

Two Insley power shovels, of the type operated by a Fordson motor, have been used on this job. These narrow shovels offer

MAINTENANCE ON REDWOOD ROUTE—Curve widening with maintenance funds on existing county road in Del Norte County. Views show condition before and after improvement by Division I.

less obstruction to traffic than most other equipment; and when attended by a number of three-wheel tractors, they are capable of moving 250 to 400 cubic yards of material per day, where hauling can be combined with overcasting.

Residents of the north coast counties, who are familiar with the past condition of this road, are duly appreciative of what has been done by the state maintenance crews. Measured by the results, the cash expenditure has been very modest, while traffic conditions have been materially improved pending the day when construction of a high standard highway can be completed.

J. J. Stockard of Division I has had general charge under the direction of Division Engineer T. A. Bedford. Lee Lane and Walter Tracy were the maintenance foremen on the job.

DIVISION V.

HEADQUARTERS, SAN LUIS OBISPO.

L. H. GIBSON, DIVISION ENGINEER.

Counties of San Benito, Monterey, San Luis Obispo, and Santa Barbara.

STEEL traffic plates have recently been installed in Division V on the San Benito River Bridge between San Juan Bautista and Hollister. Two traffic lanes, as installed, consist of four lines of 20" x 2/16" A. W. steel traffic plates, 707 feet long, fixed by lag screws and bolts to the 4" x 12" planks. The plank floor between the treads is surfaced with a thin protecting coat of oil macadam.

It is somewhat too early to determine just how well traffic will follow the treads. Roy S. Peck, foreman in charge, declares

ORTEGA HILL—New state highway over Ortega Hill south of Santa Barbara, Division V. View shows traveled roadway and wide parking space for lookout over Santa Barbara channel.

that on the day the bridge was opened, women drivers insisted on driving between the plates, men on the plates as intended, while heavy loads and busses took the two center traffic treads.

By the time this is in print, it is expected that Pismo line change will have been completed and opened to traffic. The new sections at Ortega Hill and through Carpinteria have been finished and opened to travel.

DIVISION VI.

HEADQUARTERS, FRESNO.

E. E. WALLACE, ACTING DIVISION ENGINEER.

Counties of Fresno, Madera, Merced, Mariposa, Kings, Tulare, and Kern, north of the Tehachapi.

DIVISION VI is planning for the opening of the Briceburg-El Portal highway on July 31st. This section paralleling the beautiful Merced River will open Yosemite Valley to comfortable automobile travel at all seasons of the year. The division has completed the oiling of twenty-five miles of the highway between Mariposa and El Portal in anticipation of heavy travel after the opening date. The oiling is being done as a dust preventive.

Resurfacing work also has been completed on 2.5 miles of the Merced-Yosemite lateral east of Planada, Merced County. Unevenness of the present 15-foot concrete base has been greatly improved by placing a 2-inch thickness of oil macadam. The work has been done in accordance with the so-called "Riverside County specifications."

County Completes Highway Section.

Fresno County has completed and turned over to the State for maintenance a section of the Sierra-to-the-sea highway west of Coalinga. The last three miles of this road is through a rugged country and required an expenditure of $150,000 for grading.

The most dangerous point on the Merced-El Portal highway has been eliminated by maintenance forces. At the King Solomon Mine two rock retaining walls were built and grading done at a cost of $1,300 of reconstruction funds.

Maintenance forces are at work widening the roadway and improving alignment on the Grapevine grade at the north end of the Ridge Route. An appropriation of $10,000 has been made by the commission for this work.

ON COALINGA LATERAL—Cut 95 feet deep at summit west of Coalinga. Heavy grading for several miles at this location has been done by Fresno County and the road turned over to the state for maintenance.

DIVISION VII.

HEADQUARTERS, LOS ANGELES.

S. V. CORTELYOU, DIVISION ENGINEER.

Counties of Los Angeles, Ventura, Orange, San Diego, and eastern Kern, south of Mojave.

THE 6.3 MILES of cement concrete pavement on the Coast Highway through the Malibu Ranch, between Las Flores and Latigo Creeks, has been completed by Ed Johnson and Sons, contractors. Westerly from Latigo Creek as far as Zuma Creek grading has been completed, and from Zuma Creek to the completed Hauser contract finish grading is in progress.

On the new Coast highway in Orange County, the new concrete pavement betwen Newport Beach and Corona Del Mar has been completed and opened to traffic. Between Corona Del Mar and Laguna Beach, placing of the rock base for an asphalt macadam pavement has been completed and the placing of the bituminous surface is in progress.

Between Laguna Beach and Serra, grading is practically completed and the placing of the 24-foot crushed gravel surface is now in progress.

Ventura Pavement Completed.

Widening and thickening of the highway with cement concrete from Camarillo to Ventura, Ventura County, has been completed, and construction of rock shoulders is now in progress between Camarillo and Springville.

Grading work has been completed on the Chalk Hill line change in Los Angeles County. The new section of the highway will be paved with a 24-foot oil macadam until the new fills have had time to settle.

Nearly half a mile of the "Long Causeway" north of Ventura has been removed and the traffic is being carried on the quarry waste rock surface placed on the sand fill back of the new seawall. The work is being done by a maintenance crew and involves the removal of over a mile of timber trestle.

BLAST VICTIMS PAID TRIBUTE

THIRTY-FIVE employees of the Commission comprising the maintenance crew of Superintendent A. W. Schmuck of Division VII have joined in asking the *Bulletin* to publish a tribute to two of their deceased associates, who were killed on June 10th last in a premature explosion on the Coast Highway south of Oxnard, Ventura County.

Thomas Gilbride, powder man and Jose Dominguez, his helper, were engaged in placing a charge for a blast in connection with slide removal operations when the explosion occurred. The bodies were never found and it is believed they were hurled into the ocean.

Gilbride was a native of Pennsylvania, 58 years of age. He learned powder work in the mining regions of his native state and had been engaged at this occupation for forty-four years. He had been an employee of the California Highway Commission for fifteen years, having first been employed as powder man on the construction of the Ridge Route. He has done the powder work on many jobs throughout Division VII.

His friends say of him: "Tommy was a cheerful, optomistic Irishman with a good word for everyone. The Division has lost an efficient workman who always did his level best."

Jose Dominguez, 26 years of age, was a willing worker who had been with Division VII for five years. He had been assigned to Gilbride as helper at the latter's request.

No relatives of Gilbride have been located, but Dominguez is survived by a widowed mother and brother.

DIVISION X.

HEADQUARTERS, SACRAMENTO.

R. E. PIERCE, ACTING DIVISION ENGINEER.

Counties of Amador, Calaveras, Alpine, Tuolumne, Stanislaus, San Joaquin, Solano, and southern Sacramento and Yolo counties.

THE VALLEY Paving and Construction Company has completed the placing of cement concrete shoulders on the Modesto-Stanislaus River reconstruction project, in northern Stanislaus County, and laying of the asphalt concrete surfacing will be under way shortly. Grading and graveling of two line changes to eliminate curves at Salida has been completed. The new grade has been surfaced with crushed rock.

Fuel oil has been tried as a dust preventive on detours alongside the Stanislaus project with considerable success.

Maintenance Activities.

Concrete foundations have been placed under the combination truss span bridge over the North Fork of Calaveras River between Mokelumne Hill and San Andreas. This is one of the county bridges taken over when the State assumed maintenance of the Mother Lode highway.

Repairs recently authorized for numerous bridges in San Joaquin County are now under way.

Division X has completed the oiling of over forty miles foothill roads. The results generally are considered satisfactory, the oiling having practically eliminated dust.

Heavy traffic over the mountain highways of the Division was reported over the Fourth of July week end.

TOURING.

First Tourist: "I motored up this way to see the scenery, but 'egads, one can't see anything for the billboards."

Second Tourist: "Yes—the billboards bother me, too—but not as much as the board bills."

DIVISION II MAINTENANCE FORCES BUILD LOADER

MAINTENANCE forces of Division II have constructed a modification of an "A" frame loading device which has proved economical and efficient on small jobs for quickly loading trucks from the roadbed, borrow pits or stock piles. The essential parts consist of a frame fitted to the truck bed to which a single block is fastened, a piece of ⅜-inch cable, a 48-inch fresno scraper with runners removed, and a Fordson or McCormick-Deering tractor.

Necessity for a back line is eliminated by use of the grizzly bars shown in the illustration which make it possible for the scraper to be pulled back by hand.

The device makes use of equipment at hand and cuts down the amount of labor needed on small jobs. From this point of view it is a desirable acquisition of the maintenance forces.

For Light Widening.

It is particularly designed for light widening work and the cleaning of thorough cuts where the loose material to be moved can be readily windrowed by a one-man grader. The windrow is made with the tractor while the truck is dumping and the loading is done directly from the windrow by the scraper.

In operation, the empty fresno is pulled back so as to just clear the lower end of the apron. The truck is then moved forward a few feet drawing with it the apron which is attached

Device for loading trucks on small jobs worked out by maintenance department of Division II. It is described in this issue.

to the truck by a chain. The tractor then draws the loaded fresno to the dumping point. The usual time for loading is about four minutes.

A crew of three men consisting of a truckdriver, a tractor driver, and a laborer, with one truck and a one-man grader, can loosen and load from 100 to 150 cubic yards of material per day depending upon the length of haul and the nature of the excavation.

A ROAD ACROSS THE AMERICAN SAHARA.

(Lankershim Press.)

ONE BY ONE, the gaps in the main line highways of the west are being filled in to make better holidays for motorists, which term includes most all of us. Interesting is the news that the *California Highway Commission* has contracted with a Phoenix concern for the building of a stretch of asphaltic concrete highway across "the American Sahara" in Imperial County, near Yuma. This road leads through the mysterious, colorful and ever-changing sand dune country. The loose plank road across it has been a bane to motorists, thousands of whom have hesitated at the trip to this scenic wonder.

Incidentally, this new road will complete one more main paved entrance connecting the rest of the west with California's famed chain of highways. One more job to be done. a mean stretch of unpaved road just south of the Oregon line, and California will present an open road to every frontier for the thousands of visitors eager to motor through the picturesque Golden State.

Matintenance section marker on Route 4. Similar markers are being placed throughout the state.

STANDARD MARKERS FOR MAINTENANCE SECTIONS ARE ERECTED

STANDARD markers for maintenance sections are being erected throughout the state by maintenance forces. The signs are 3 feet by 5 feet mounted on two 5-inch by 6-inch redwood posts.

The signs are being placed at boundary lines between sections. Below arrows pointing in either direction are the names of the foremen and places where they have their headquarters. The top of the sign carries the information that the road is a state highway, the number of the route, etc., as shown in the illustration.

By means of these signs, the public may know who is responsible for the condition of the highway and the place where a representative of the department may be found.

PASSING THE BUCK

(American Highways.)

THE smaller the political unit compelled to finance a main highway, the greater injustice shown and the less likelihood of having a road improvement to meet the economic need. Yet there are those who would pass the financial responsibility on to their neighbors—the national unit to the state unit, and the state unit to the local unit.

It is absolutely unfair for the larger political unit to attempt to make a showing of small expenditures by passing on to the lesser unit its own share of the financial responsibility.

Such reductions of federal expenditures would mean no real saving to the people. Road improvements must go on. Unimproved roads mean added transportation costs. Business, through transportation, has eliminated state lines and made the highways a national function.

There are two sides to every road—the creditor and the debtor. This nation can not ride on one side without returning on the other. Drive to the right.

SHOP USES COMPRESSED AIR TO CLEAN TRUCKS FOR PAINTING

AT THE headquarters shop of the California Highway Commission at Sacramento the painting of trucks by compressed air has reduced the cost of this work, as against hand painting, by more than 50 per cent. Formerly it required two men one day to paint a truck by hand brush, but by the air-spray system one man can now paint a truck in one day and do a much better and more satisfactory job, says *Compressed Air Magazine,* a representative of which recently visited the shop.

To facilitate operations, the supply of paint is poured into a bucket which is suspended from the shop ceiling and raised and lowered by the aid of a pulley. Attached to the bottom of the bucket is a hose through which the paint is fed by gravity to the paint spray. When ready to begin work, the bucket is raised to the desired position, thus permitting a steady flow of paint to reach the spray nozzle.

But before a truck is painted it must first be cleaned; and for this purpose compressed air is also used. By means of a stream of air, discharged from a blow gun, the dust and dirt are quickly removed and the car made ready for its new coat of paint.

Two trucks recently turned out at Headquarters Shop, Sacramento, with bodies designed and built by Equipment Department. Truck at left is equipped with a hydraulic hoist.

More and more the small as well as the larger cities of all the states are realizing the importance of routing through highways around the edge of the town rather than straight down "Main Street." Traffic congestion of the cities and towns has been the factor which has brought about the change of ideas. So rapid has been the increase in the number of cars in the last few years that city fathers have had to study ways and means of reducing the congestion rather than increasing it by the old method of diverting outside traffic through the central districts.—*Kentucky Highways.*

CALIFORNIA SPECIFICATIONS TO BE FOLLOWED IN ARGENTINA

SPECIFICATIONS for highway construction and maintenance of the Public Works department of the Argentine Republic are being revised along the lines followed by the California Highway Commission, reports Arturo Monge, subdirector of Bridges and Highways. Director Monge recently requested information on California methods and in reply to the material sent him, he writes as follows:

> I take great pleasure in acknowledging receipt of the various publications of the California Highway Commission which you have been kind enough to send me. * * *
>
> I find that the matter contained in those bulletins and papers is most valuable to us, as the work in which we are engaged at present runs very much along the same lines of the work that is conducted by the California Highway Commission.
>
> We are now undertaking the revision and readjustment of our specifications and regulations for public works connected with highway construction and maintenance, and the papers you have sent me contain a good many suggestions which I propose to adopt and adapt to our work.

STRONGER CONCRETE

IN THE face of the phenomenal increase in the volume of motor truck and bus traffic utilizing rural highways, the intelligence, recently made public by the California Highway Commission that the cement concrete highways of the Golden State had increased in strength, on an average, approximately 25 per cent, is pleasant news to the citizenry. That this added strength has been achieved at no additional cost to the State is remarkable. That the efforts of the construction and research divisions of the Highway Commission, to say nothing of the individual contractors, have been so well coordinated, is amazing.

The records show that the average compressive strength of concrete has increased from 3151 pounds in 1924 to 4311 pounds in 1925. Refinements in proportioning of aggregates, of course, is the *primum mobile* for this extraordinary record, but it would have been totally impossible without adequate inspection and the active interest of engineers, in the office and in the field, as well as the contractors.

It is gratifying, moreover, to note that the highway department in developing the strength of concrete has not lost sight of that other and most important desideratum in the construction of hard-surfaced roads, to wit, methods of finishing that insure smooth and comfortable surfaces. If cement concrete highways ever were in poor repute, it was because they disintegrated under heavy traffic and often, through second-rate workmanship, presented a rough and corrugated surface to travel. If the California department can remedy these two faults, it will have contributed immeasurably to the attainment of an ideal road.—*Western Highways Builder.*

THE MAN INSIDE.

There's a man inside of the man that you are,
And he's bigger than you, yes, bigger by far;
And he's checking you up in every way,
And for each transgression he makes you pay;
And for each good deed he will pay you
A reward far beyond the price that is due.
So be good to him and respect this man,
Believe in his judgment, nor fear his ban.
There's a man inside of the man that you are;
If you listen to him you will travel far;
So listen and heed; don't be a fool,
And do what you do by the Golden Rule,
And build the man as you would a ship,
Sturdy and true for life's service trip,
And trust him well, he's your compass and guide,
And ever respond to the man inside.

By Jamie Heron.
From—"Measure of a Man."

HIGHWAY NEWS NOTES

L. E. McDOUGAL, formerly with Division X, is now with the headquarters maintenance department as assistant maintenance engineer.

F. C. Hewitt, maintenance superintendent at Stockton, will take Mr. McDougal's place as construction assistant in Division X. W. H. Martin, superintendent in charge of the Big Oak Flat road, will move to Stockton to succeed Mr. Hewitt.

A. K. Nulty has returned to Division X as assistant resident engineer after several months with Division VII in Southern California.

L. D. Packard and A. B. Willett of the Bridge Department attended the Air Service Reserve Officers' Training Camp at Rockwell Field during July.

Misses Kathryn B. Melarkey, Hazel Brown, Grayce Maddox, and Mr. Marion McGriff are members of the headquarters staff who have enjoyed vacations in British Columbia during recent weeks.

George T. Gunston, assistant to Secretary W. F. Mixon, is the proud father of a second daughter, Zoe Marie, who arrived early in July.

Miss Elizabeth Etzel motored as far south as San Diego during a recent vacation. Miss Beulah Francisco spent a week in Yosemite Valley.

Mr. Myron Evans, formerly with the office of prison road camps, is now a member of the staff of the State Controller. Miss Dorothy Addison, of the same department, is now in the San Francisco office of Paul F. Fratessa, attorney for the Commission.

STATE HIGHWAY FUND CONTRACTS (Bond Funds, Including Federal Aid)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE JUNE 8, 1926						
476	VIII	San Bernardino	31	D-E-F	Victorville to Hicks	25.74	Grade and Rock Surface	H. G. Fenton	$182,037.49	July 29, 1925	------
					AWARDED SINCE JUNE 8, 1926.						
503	VIII	Imperial	26	H	Between Brawley and Westmoreland	6.46	Grade and Rock Surface	F. C. Payton	120,890.26	June 28, 1926	200
504	VI	Fresno	------	------	At Fresno	------	Division Office Building	Shorb and Neads	18,893.25	June 28, 1926	100
505	VI	Fresno	------	------	At Fresno	------	Plumbing and Heating (Div. Office)	Barrett Hicks Co.	3,513.38	June 28, 1926	100
506	VII	Ventura	60	A	Between Point Mugu and Little Sycamore Creek	------	Reinf. Conc. Pipe Culverts	Christ Thoren	13,616.27	June 28, 1926	75
507	VII	Orange	60	A	Branagan Crossing	------	Underpass	W. M. Ledbetter Co.	18,669.04	July 14, 1926	125
508	II	Tehama	3	B	Across Reeds Creek at Red Bluff	------	Concrete Girder Bridge	Holdener Construction Co.	35,732.25	July 14, 1926	150
509	VIII	Riverside	64	D-E	Between Black Butte and Blythe	9.5	Grade and Rock Surface	S. Y. Faucett	76,261.68	July 14, 1926	150
510	IV	Sonoma	1	A	Through Cloverdale	1.33	P. C. Concrete Pavement	J. V. Galbraith	58,570.31	July 14, 1926	125
					Sub-total	17.29			$346,146.44		
					PENDING AWARD—NONE.						
					Total State Highway Fund Contracts Awarded and Pending Award	17.29			$346,146.44		

NOTE.—Primary construction covered by the above contracts does not include funds obligated on cooperative forest highway projects, prison camp road activities, or day labor jobs not being done under contract.

STATE HIGHWAY MAINTENANCE FUND CONTRACTS (Including Gasoline Tax Fund)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE JUNE 8, 1926						
M-103	V	Santa Barbara	2	J	Summerland to Montecito	1.40	Grade and Rock Surface	McCray Co.	$77,885.15	Oct. 23, 1925	------
M-105	VIII	Riverside	26	B	Beaumont to Banning	3.04	P. C. Concrete Pavement	Gen. Heiz and Co.	93,771.90	Nov. 13, 1925	------
M-109	V	Santa Barbara	2	H	Between Carpinteria and 2 miles Southeast	2.10	A. C. Pave.—Portions widened P.C.C.	Cornwall Construction Co.	58,793.22	Nov. 30, 1925	------
M-114	V	Los Angeles	------	------	At Lankershim	------	Maintenance Shop Building	Hodge and MacMackin	20,070.00	Mar. 17, 1926	------
					AWARDED SINCE JUNE 8, 1926.						
M-132	V	Santa Barbara	2	K	Across San Jose Creek	------	Concrete Girder Bridge	Mattock and Feasey	11,623.27	June 28, 1926	125
M-133	VIII	Riverside	26	E-F	Between Indio and 6 miles south of Coachella	8.99	P.C.C. Widening and A.C. Surface	Southwestern Paving Co.	210,104.68	July 14, 1926	175
					Sub-total	8.99			$221,727.95		
					PENDING AWARD.						
------	IX	Inyo	------	------	At Bishop	------	Maintenance Shop Building		16,522.88	------	100
					Total State Highway Maintenance Fund Contracts Awarded and Pending Award	8.99			$238,250.83		

NOTE.—The above obligations charged against the State Highway Maintenance Funds do not include funds from these sources obligated for general maintenance and for specific betterments being done under day labor authorization.

HIGHWAY GENERAL FUND CONTRACTS

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
501	IV	San Mateo	68	B	Btw. South San Francisco and San Mateo	------	Right of way fence	Lozier and Carr	$9,493 65	May 27, 1926	60
					PENDING AWARD.						
------	IV	San Mateo	68	B	South San Francisco Crossing	------	Undergrade Crossing		243,876 60	------	400
					Total Highway General Fund Contracts, Awarded and Pending Award	------			$253,370 25	------	------

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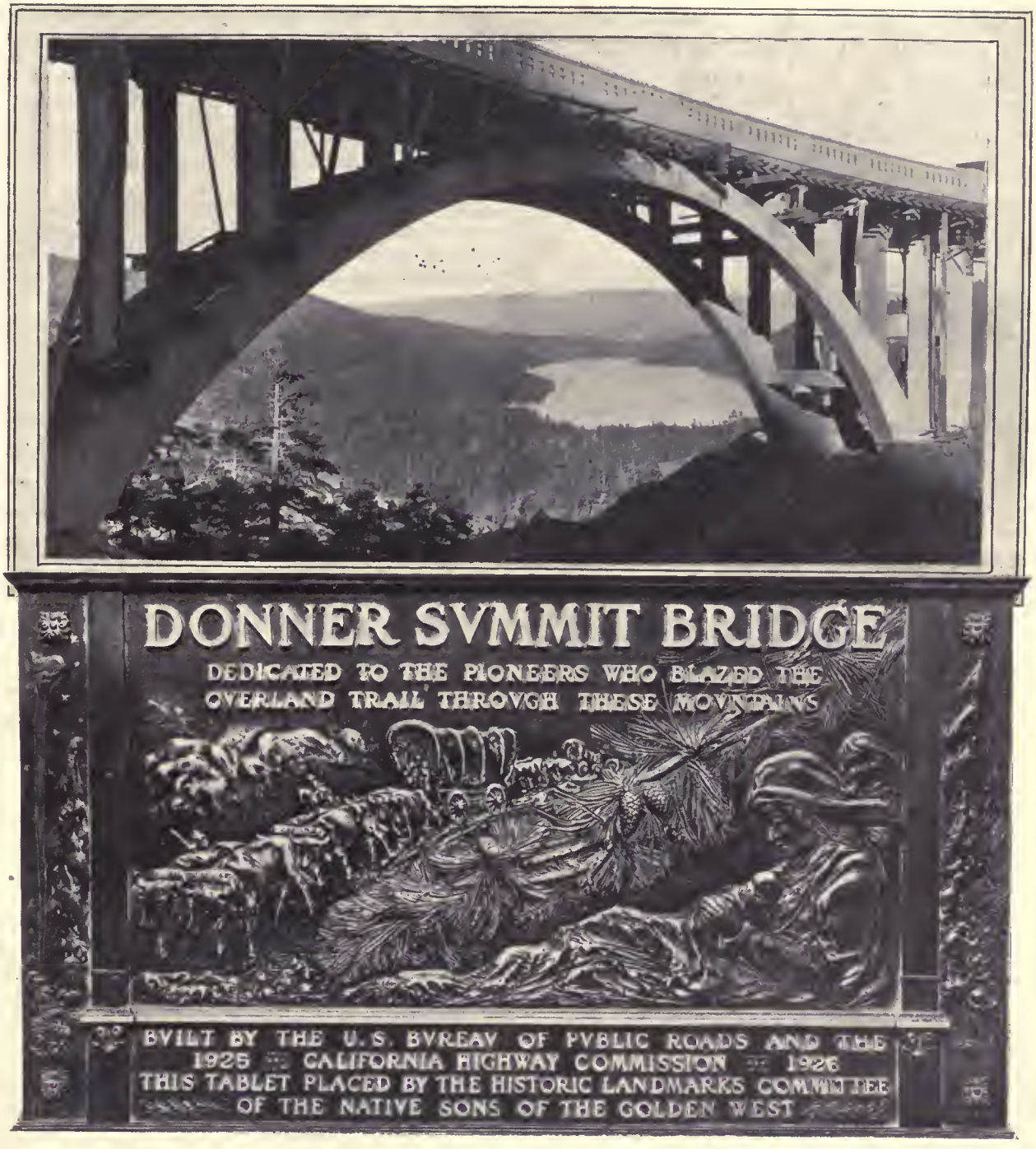
CALIFORNIA HIGHWAYS

A BULLETIN ISSUED BY THE CALIFORNIA HIGHWAY COMMISSION FOR THE INFORMATION OF ITS EMPLOYEES AND THE PUBLIC

Vol. 3 SEPTEMBER, 1926 No. 9


DONNER SVMMIT BRIDGE
DEDICATED TO THE PIONEERS WHO BLAZED THE
OVERLAND TRAIL THROVGH THESE MOVNTAINS
BVILT BY THE U.S. BVREAV OF PVBLIC ROADS AND THE
1925 CALIFORNIA HIGHWAY COMMISSION 1926
THIS TABLET PLACED BY THE HISTORIC LANDMARKS COMMITTEE
OF THE NATIVE SONS OF THE GOLDEN WEST

CALIFORNIA HIGHWAYS

This Bulletin is published by the California Highway Commission for the information of its employees and the public. Editors of newspapers and others interested are welcome to use, without restriction, any of the matter herein contained. Cuts will be gladly loaned upon request.

FRANK B. DURKEE - - - Editor

P. O. Box 1103, Sacramento, California.

Vol. 3 SEPTEMBER, 1926. No. 9

CALIFORNIA HIGHWAY DEPARTMENT

FRIEND Wm. RICHARDSON, Governor.

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R. E. PIERCE (Acting), Division X, Sacramento

General Headquarters, Fifth Floor, Forum Bldg., Sacramento, California.

ADJACENT to the cities, more intensive settlement of land seems to follow construction of State highways. This evolution in ownership and in usage brings up an interesting study in psychology of ownership which should be thoughtfully considered by all of the engineering employes.

It is almost axiomatic that when land is used for farming, the attitude of the property owner is against setting aside for the use of the public any more than the minimum width of right of way. Many bitter disputes have arisen over the obtaining of widths of 60 feet, which was the former standard, and it is still more difficult to induce owners of farming land to dedicate the present standard of 80 feet. There are, of course, exceptions.

Subdivision Changes Attitude.

This attitude often changes when the character of the land changes from agricultural to subdivisional. Immediately the owner appreciates that all possible advantages of location and frontage should be developed by him to interest prospective purchasers. We find quite generally a desire on the part of

(Continued on page 12.)

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EVERY employee of the highway commission has a direct interest in the improvement of the highway organization's methods and results, both engineering and clerical, office and field. To that end, the State Highway Engineer invites constructive criticism or suggestions from every employee.

Ideas as to the more economical and efficient handling of your job, or suggestions for elimination of waste will be welcomed. Criticism is also desired from persons outside the organization, who are in a position to give facts.

Send only signed communications addressed as follows: California Highways, P. O. Box 1103, Sacramento, Cal.

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Donner Summit Bridge Marks Evolution of Overland Trail

MARKING forcefully by its very boldness the evolution of the emigrant road of the pioneers into the great transcontinental highway of the present, Donner Summit bridge, near the crest of the Sierra in Nevada County, has been completed and opened to traffic. It is dedicated, "To the Pioneers who blazed the Overland Trail through these mountains." Descendants of survivors of the Donner party, the terrible tragedy the scene of which the bridge overlooks, joined with Native Sons of the Golden West and state and federal highway officials on August 22d in the formal unveiling of a memorial tablet on the spectacular structure.

High up amid the granite crags of the Sierra, Donner Summit bridge, a forest highway project, is one of the most unique structures on the state highway system of California. It spans a rocky chasm at an elevation of nearly 7,000 feet and was built to make possible a grade of not to exceed 7 per cent from Donner Lake to the Summit; eliminating for all time the 18 and 20 per cent grades of the old road, first projected in early days, and for years the most difficult section of the most important interstate connection to the East in northern California. The new state highway is the third road to be built up this rocky precipice.

Unusual Engineering Features.

Unusual engineering features of the bridge make it a distinctive structure. It has a handsome arch 110 feet in length with a depth of 70 feet, yet it is built on a compound curve and on a grade of 7 per cent. Its clear roadway width is twenty-four feet and its total length, including approaches, is 241 feet.

As a part of the lower approach span, there has been constructed an elevated observation platform twenty-five feet in length and seven feet wide, on a pedestal of which the memorial tablet of the Native Sons was placed. Here the motorist may enjoy, safely guarded from passing traffic, the marvelous view of the high Sierra and the Donner Lake basin which unfolds below. It was near this spot that the Donner party turned back in October, 1846, balked by snow in its attempt to cross the summit. Because of the historical significance of the spot, the observation platform was deemed appropriate. A wide parking place for automobiles also has been provided near by.

Donner Summit bridge was built by the United States Bureau of Public Roads in accordance with plans furnished by the bridge department of the California Highway Commission. Funds came from federal appropriations for roads within the national forests. C. C. Gildersleeve was the contractor and C. S. Bruning resident engineer for the bureau. Cost of the bridge, including the features added after the contract was awarded, was approximately $40,000.

Bridge Part of Larger Improvement.

The bridge, destined to become a well known stopping place on the Victory highway, is the outstanding feature of a larger improvement which includes the grading and surfacing of 6.9 miles of the state highway from Soda Springs to Donner Lake. This new section is now open to traffic, eliminating three dangerous grade crossings of the Southern Pacific railroad.

The section from the lake to the Summit, 3.2 miles, was graded by the California Highway Commission at a cost, including engineering, of $212,500. It involved difficult construction largely through solid granite. The section from the summit to Soda Springs, 3.7 miles, was graded by the Bureau of Public Roads as a forest highway project at an approximate cost of $120,000. Surfacing of both sections, 6.9 miles, was another forest project in charge of the bureau, the work costing approximately $75,000; making a total expenditure for the improvement of the seven miles, including Donner bridge, of nearly a half million dollars.

The entire section has been built on high standards of alignment and grade and is of ample width to care for a heavy traffic. Besides eliminating three grade crossings and the steep and winding grades of the old road, the superior location of the new highway should permit opening of the route to traffic several weeks earlier in the spring.

Many Attend Dedication.

Harvey M. Toy, chairman of the California Highway Commission, presided at the dedicatory ceremonies, which were attended by a large gathering. Among those taking part were:

NUMBERS 4 AND 8 ARE HIGHWAY FINANCING MEASURES ON NOVEMBER BALLOT

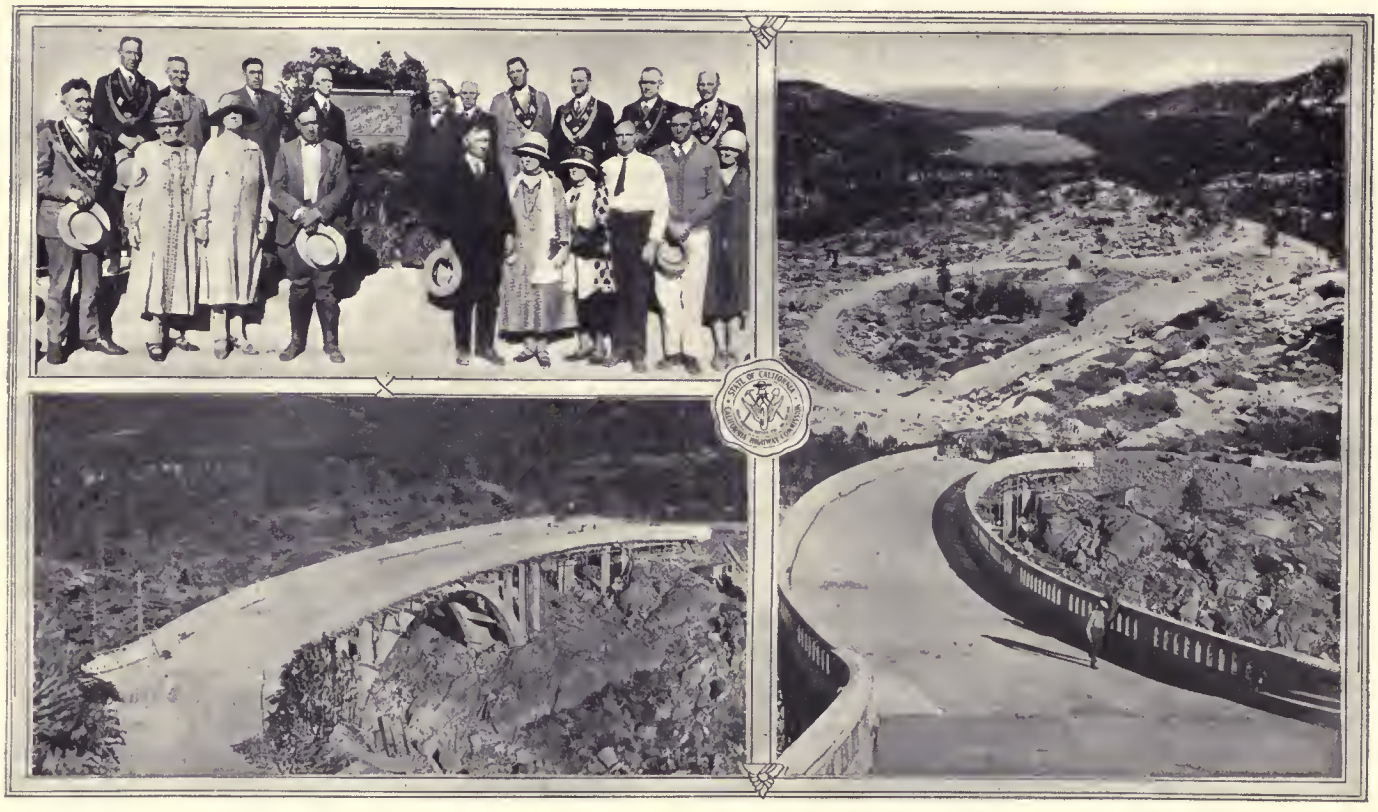
TWO HIGHWAY FINANCING MEASURES, both submitted directly to The People by initiative petition, will appear upon the ballot at the general election on Tuesday, November 2d. They will be propositions Numbers 4 and 8. The financing of future state highway construction in California, a matter of state-wide discussion for the past three years, is now directly before the electorate for decision.

This is as it should be, for The People now have opportunity to pass upon this vital question and to remove it from the field of controversy.

The texts of the two measures submitted to the referendum are set forth in full, together with arguments for and against, in the official pamphlet which is distributed by the Secretary of State, prior to the election, to each registered voter.

The California Highway Commission and the State Highway Engineer, mindful of the importance to the state of the completion of the state highway system, commend a careful study of the two proposed financing measures, Numbers 4 and 8, by the electors of California.

SPECTACULAR BRIDGE DEDICATED TO MEMORY OF PIONEERS



TRAIL BLAZERS REMEMBERED—*Upper left,* group of state officials, officers of Native Sons and Daughters, and descendants of Donner party survivors taking part in dedication of structure on August 22d; *Below,* view of bridge; *Right,* bridge and new state highway descending by easy grades to Donner Lake in background. (Southern Pacific snow sheds at upper right of view.)

Hilliard E. Welch, of Lodi, grand president of the Native Sons of the Golden West; Dr. Eva Rasmussen, of Sacramento, past grand president of the Native Daughters; Fletcher A. Cutler, past grand president of the Native Sons; C. F. McGlashan, of Truckee, author of the History of the Donner Party; George G. Radcliff, chairman of the State Board of Control; John T. Skelton, of Sacramento, who read letters from two of the living survivors of the Donner party; and Lewis F. Byington, of San Francisco, past grand president of the Native Sons, who delivered the dedicatory address; Native Sons and Daughters of Truckee and W. B. Gelatt of Donner Lake.

Descendants of survivors of the Donner party present were: James Fraser Lewis; Martha Jane Lewis, and Susan A. Lewis, of Santa Cruz, son and daughters of Martha Jane ("Little Pattie") Reed-Lewis, deceased; and Ernest H. Murphy, of Marysville, son of William G. Murphy.

The memorial tablet reads as follows:

> "Donner Summit Bridge; dedicated to the pioneers who blazed the Overland Trail through these mountains; Built by the U. S. Bureau of Public Roads and the California Highway Commission, 1925-1926. This tablet placed by the Historic Landmarks Committee of the Native Sons of the Golden West."

AID OF PUBLIC IN PUNCTURE VINE FIGHT IS WELCOMED

THE motoring public can materially aid in the campaign of the Highway Commission and the various counties for the eradication of puncture vine along the highway right of way and such aid will be welcomed, it is announced by State Highway Engineer R. M. Morton.

Maintenance forces are continually cooperating with county horticultural commissioners and considerable amounts have been expended in an effort to rid the highways of the pest, the spread of which is fraught with so much danger to agriculture.

Motorists who observe patches of the weed growing along the highway are urged to give the information to the local maintenance foreman, who has instructions to destroy the pest wherever found. The name and address of the foreman will be found on maintenance section markers posted along the highway at boundaries of the sections. The information also may be forwarded through the automobile clubs or chambers of commerce. The location should be described as specifically as possible.

PRIZES OFFERED FOR ESSAY

CALIFORNIA engineers who have entered the essay contest of the American Road Builders' Association have until October 10th to get their manuscripts in the hands of Chas. M. Upham, business director of the association, P. O. Box 1270, Raleigh, North Carolina, it is announced.

The essays must not exceed 1500 words in length, but the subject is limited only to methods, materials, equipment, maintenance or operation of highways. Any engineer of the rank of inspector or rodman of above, excepting State Highway Engineers, is eligible to compete.

The first prize is a free trip to Chicago to attend the annual convention of the American Road Builders' Association which takes place during Good Roads Week, January 10th to 15th. In addition, there are several cash prizes.

PAVEMENT RECONSTRUCTION STUDIES AS CONDUCTED BY THE CONSTRUCTION DEPARTMENT

By C. S. Pope, Construction Engineer.

THE studies necessary for a proper investigation of pavements which it is proposed to reconstruct have been given attention by the Construction Department and some of the features entering into the problem are presented herewith:

1. *GRADE AND ALIGNMENT SURVEY.*

It is usually desirable, though not always necessary, that a grade and alignment survey with the necessary cross sections should be made. If grade and alignment surveys show that an extensive destruction of old pavement will result or if the original line will be deviated from seriously the economic comparison of pavement types may be extensively modified; as may also the condition survey hereinafter mentioned.

Surveys should give grades and cross sections of the old pavement with sufficient accuracy to determine the amount of surface material in tons or cubic yards which will be required.

Curves which do not conform to present standards for either horizontal or vertical curvature should be studied and reconstructed where necessary.

Superelevation needs to be provided for in most cases as a considerable amount of former work is lacking in proper superelevation.

Grade in excess of three or four per cent of excessive curvature is usually considered a condition adverse to asphaltic types of surfacing, though recent developments in pavements of this type should make a change in sentiment in this regard.

2. *CONDITION SURVEY.*

Before deciding upon a pavement type for reconstruction over old paving a condition survey of the old pavement should be made.

In the case of an old stone or macadam or bituminous macadam road, if the same is on the proper grade, an accurate determination of the thickness of road metal available should be made by digging through the road metal at intervals of not over two hundred feet.

Cuts should be made through the crown and at each quarter point and the thickness recorded.

If old concrete is to be resurfaced it should be examined and classified at suitable intervals in accordance with the Bureau of Public Roads classifications which are as follows:

Class A—Normal number of transverse cracks but no longitudinal cracks.

Class B—More than normal number of transverse cracks and some corner breaks.

Class C—Similar to A and B but with longitudinal crack and a considerable number of corner breaks.

Class D—Tranverse and longitudinal cracks so numerous as to break pavement into slabs less in area than Class C but not less than 50 square feet.

Class E—Cracks so numerous as to break pavement into slabs less than 50 square feet in area but no general disintegration.

Class F—Badly broken and with disintegrated paving.

If the old concrete has been surfaced, the surface should be removed at intervals for a width of one foot across the entire width of the pavement in order to properly examine the base.

It is generally assumed that a concrete pavement in Class C condition or better, may be successfully surfaced with asphaltic concrete from 1½ to 2½ inches minimum thickness.

Paving in Class D or Class E condition may sometimes be saved with asphalt concrete surfacing from 2½ to 4 inches in thickness, although additional concrete base construction is considered better practice, except on the best foundation soils.

Paving in Class F condition usually requires complete reconstruction, though sometimes it may be saved by use of second story concrete.

3. *ECONOMIC TRAFFIC STUDY.*

An economic study of pavement types is impossible without a proper traffic census, a knowledge of the first cost of various types of pavement and accurate information as to the cost of maintenance of each type. Formerly this information was not available, but under our present methods of recording information, the various factors required for a proper solution of this problem will be available with increasing accuracy each year.

If we are able to establish accurately certain factors the economic trend of the problem of comparison of types is quite simple, and may be reduced to mathematical solution.

4. *SOIL SURVEY.*

It is now common practice to make a soil survey even for reconstruction work.

Both alkali and adobe soils have been found adverse to concrete pavements and require treatment before such pavements are laid. Sandy soil is particularly favorable to concrete pavements.

Asphaltic concrete and macadam are not affected by alkali, but require special base construction to be entirely satisfactory on adobe soils.

Among other matters which should be given consideration, in addition to the above mentioned matters of major importance, are the following:

Make a survey of road building materials available and establish availability of material and plant suitable for different types of construction.

Report prevailing weather conditions and usual amount of wet weather which might be unfavorable to any particular type of paving.

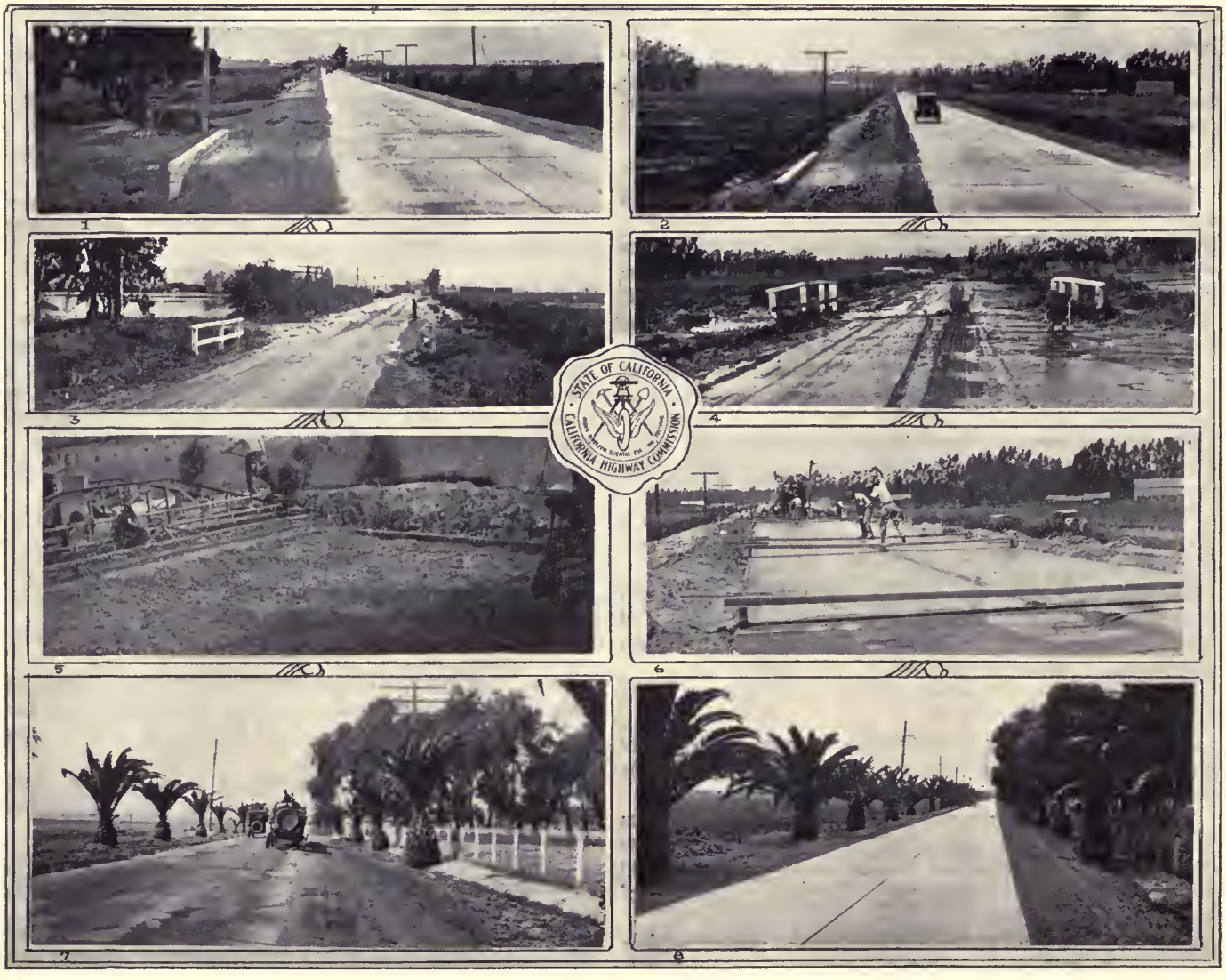
Consider and compare following constructions:

(a) Flush shoulders of concrete.
(b) Asphalt Macadam surface and shoulder.
(c) Asphalt Concrete surface and shoulder.
(d) b and c with Portland Cement Concrete shoulders.
(e) Sheet Asphalt in combination d.
(f) Second story concrete.

Compare the consistency of recommended construction with that used in other parts of the State under similar conditions.

FROM THE ABOVE BRIEF OUTLINE IT SHOULD BE APPARENT THAT SOUND PRACTICE DICTATES THAT CONCLUSIONS AND RECOMMENDATIONS FOR THE TYPE OF CONSTRUCTION TO BE USED SHOULD BE REPORTED WITHOUT REGARD TO PERSONAL PREFERENCE AND OPINION BUT IN ACCORDANCE WITH AN ECONOMIC AND ENGINEERING ANALYSIS BASED ON DESTRUCTIVE TRAFFIC TO BE CARRIED BY THE PARTICULAR ROAD UNDER INVESTIGATION.

SOME INTERESTING PROBLEMS SOLVED ON VENTURA COUNTY RECONSTRUCTION PROJECT



BEFORE AND AFTER VIEWS ON COAST ROUTE—1 and 2, views of new 20-foot concrete pavement placed on raised grade in the vicinity of Beetox, on Camarillo-Ventura reconstruction project, Ventura County; 3 and 4, views at same location following flood prior to reconstruction. The old pavement at this point was lower than level of land on the upper side, with result that it was flooded each winter. New pavement, with numerous large culverts, is expected to correct this condition. 5 and 6, construction views; and 7 and 8, *before* and *after* views not far from Camarillo. (Photos by Division VIII.)

By A. D. GRIFFIN, Resident Engineer, Division VII.

WITH the completion on August 14th of the H. H. Peterson reconstruction contract, another heavily traveled section of the Coast Highway in Ventura County, 13.2 miles in length, was made adequate for present day traffic. All embankments were widened to 30 feet, all culverts and bridges extended accordingly, and three miles of flush cement concrete shoulders, to give five feet of added width to the existing pavement, were placed, together with 10.2 miles of "second-story" cement concrete pavement, 20 feet in width.

The original pavement, which was 15 feet wide and four inches thick, was placed in 1917 by the Modern Construction Company. Because of ideal, sandy subgrade conditions, three miles of this pavement was still in good condition and required widening only, by flush shoulder construction. These shoulders were constructed six inches thick.

The pavement on the balance of the section had about outlived its usefulness as a safe and comfortable riding surface. A "second-story" pavement was laid with a minimum thickness of five inches at the center, which was increased to seven inches over the edge of the old slab, and to nine inches at the edge of the new pavement. At grade changes, all new pavement was placed seven inches thick, increasing, beginning at points two feet from the center and edges, to a thickness of nine inches. All full width pavement was marked with the V center line groove as previously described in the *Bulletin*. Curves were flattened to a radius of 1,000 feet or less and given standard superelevation.

Earth at a Premium.

The roadway on this section is almost entirely on embankment and there was little chance to secure material for widening from within the right of way, since deep, dangerous, and un-

REBUILDING OF CAMARILLO-VENTURA SECTION COMPLETED

sightly side ditches are no longer tolerated on State highways. In a fertile valley planted to beans, beets, walnuts and lemons, and provided with irrigating systems, no farmer will countenance borrow pits in his land to supply earth for the highway, regardless of compensation. This made it necessary to thoroughly inspect the surrounding country to locate spaces where earth could be secured, and if possible good done instead of harm.

One farmer was found who had a layer of clay top soil, a foot or so thick, which he wished skimmed from his bean field to make available the richer soil underneath. This yielded 10,000 cubic yards without cost for the dirt, itself. Another had a knoll the removal of which netted another 10,000 cubic yards and improved the tract for irrigation. A school yard was leveled to yield 2000 yards.

State Builds Reservoir.

Near Montalvo, a mutual water company contemplated the building, in the future, of a reservoir with a capacity of six acre feet on a site a half mile from the highway. Plans called for a balance of cut against fill. Discussion of the matter with the stockholders resulted in the building of the reservoir by the State entirely in cut in return for the material excavated. Thus 8,000 cubic yards were made available for use on the highway.

In the vicinity of Beetox, for a mile and a half, farmers had erected along the property line barriers to the flow of storm water to cause a deposit of fertile silt on their bean fields. With the passage of years, the level of the land adjoining the highway on the upper side was raised until it averaged two feet higher than the existing pavement. This caused culverts to fill with silt with the result that the flood waters passed over the pavement along the entire stretch, depositing slippery clay silt which was the cause of numerous serious accidents. To overcome this it was necessary to raise the grade, in some places as much as three and one-half feet, so that the new pavement would be above the level of storm waters; new culverts, and more of them, were constructed at a higher level.

Property Owners Cooperate.

Property owners, realizing the necessity for raising the grade of the highway, in a fine spirit of cooperation, permitted the State's contractor to make a deep ditch up to fifty feet in width just beyond the right-of-way line, from which 32,000 cubic yards of earth were removed for embankments. Although crops were lost from about eight acres, no damages were asked of the State as it is probable that during the first heavy storm the silt-burdened flood waters will replace all "borrowed" material.

To guard against the linear shrinkage of the clay fill at Beetox, a protective sand blanket a foot in thickness was placed immediately prior to paving operations.

Aggregates for Concrete.

Rock and sand for concrete were supplied by the Saticoy Rock Company which provided special storage bins for specification rock and sand in order to create a reserve supply. Sand was stockpiled for twenty-four hours to drain off excess water. Proportioned batches were delivered to the contractor, the sand being weighed and the rock measured.

To secure rock grading in accordance with the specifications, a long conveyor belt was run under spouts which tapped commercial bins. By regulating gates in each size, the required grading was uniformly secured and it was possible to use a rock, close to the coarse limits of the specifications, without danger of sacrificing workability because of grading fluctuations. A stronger concrete was thus obtained.

The superintendent for the contractor, Mr. S. T. Corfield, formerly assistant division engineer in Division VI, handled the job efficiently, to the end that the entire project was opened to travel several days ahead of the expiration of the time limit of the contract.

ENGINEER DECLARES CALIFORNIA LEADS IN QUALITY OF ROADS

AFTER an automobile trip extending over 10,000 miles from California to the Atlantic coast and return, including in its itinerary twenty-four states, E. E. East, chief engineer for the Automobile Club of Southern California, has returned convinced that California is still leading the Nation in road building. This is particularly true, Mr. East emphasizes in his report, as regards riding qualities of pavements and the safety features which are now being embodied in the design and construction of State highways.

East said he was surprised to find on some of the principal transcontinental roads in the East grades that required second gear over long distances; sharp blind curves and innumerable sharp, vertical curves which completely obstructed the view of approaching vehicles—construction which would not be countenanced in California.

Bridge construction in many states, he says, is far below the standards of this state. Only on grade separations are the eastern states apparently making faster progress than is California, which, of course, is due here largely to the lack of funds.

Quality, in recent years, has been the watchword of construction in California; standards of alignment and grade have been increased far beyond the plans of engineers a few years back; new pavements have a minimum width of twenty feet and vary in thickness from six to nine inches at the edges, with special reinforcing where necessary. Width and strength of bridges also have been increased with the increasing standards of other features of the highway.

OILED SHOULDER EXPERIMENT

Sand shoulders, particularly those adjacent to river crossings, have caused considerable trouble on the Valley route in Division VI. An oil treatment has been tried adjacent to the Merced River which promises satisfactory results.

Previously, one-half gallon per square yard of 45 per cent oil was harrowed into the sand about four inches deep and six feet wide. This, however, did not bind satisfactorily, especially in the light blow sand. Recently, one-half gallon per square yard of 65 per cent oil was worked in and indications are that the trouble at this particular point is over.

Equipment Department.

Machinery having been installed, the new shop building at the Lankershim yard is now in use. The building, modern in design, is 60 feet wide and 140 feet long, with a blacksmith shop adjacent. The new machine shop is well lighted and ventilated and fully equipped.

Staying up all night may make you as wise as an owl, but owls have no sense during the day.

BIG LAGOON TRESTLE CUTS DISTANCE ON REDWOOD ROUTE

BIG LAGOON TRESTLE—Views of new 4000-foot structure recently completed on Redwood highway, in Humboldt County. Upper view shows pedestrian walk separated by curb from traveled portion of bridge. (Photos courtesy Redwood Highway Association.)

CONSTRUCTED, with the exception of the piling and the asphalt surfacing of the floor, of "ever living" native redwood, the trestle across Big Lagoon, Humboldt County, the latest improvement on the Redwood Highway, has been completed and opened to traffic. The trestle is approximately 4000 feet long and, together with its approaches, represents an improvement on standard alignment 1.4 miles in length. It takes the place of more than three miles of narrow, crooked and dangerous county road.

Cedar was used for the piling, but the entire superstructure was built of redwood timber, of which approximately 1,385,000 feet were used. The floor has a wearing surface of asphalt concrete. It is the largest structure using native wood on the state highway system.

A feature of the structure is the safety walk for pedestrians, which is protected from the traveled portion of the bridge by a heavy timber curb. This walk was added, when it was realized that completion of the bridge would be followed immediately by its use by fishermen. Because it is adjacent to the ocean, tourists also will desire to stop to take photographs and to view the surrounding country. A walk seemed necessary to make the long trestle safe, and it was therefore added to the plans shortly after the contract was awarded. The walk has a width of four feet, while the clear roadway width of the trestle is twenty-one feet.

The Mercer Fraser Company of Eureka was awarded the contract for both the trestle and the grading of the approaches on a bid of $140,251. Construction proceeded so rapidly it was possible to open the structure to traffic more than a month ahead of the contract time.

C. M. Butts represented the bridge department as resident engineer. Grading of approaches was also in charge of Mr. Butts.

CITIES URGE THROUGH TRAFFIC ROUTE OFF MAIN STREETS

IN THE early days of construction every community in the state wanted the State highway routed down its Main street. Business which was to be thus gained and other advantages to be secured were regarded of inestimable value.

Times are changing. The great increase in motor vehicle registration has resulted in a traffic which chokes the highways. Through traffic no longer needs to stop for repairs or gasoline at every community center along the route; great distances often are covered without a single stop and the through driver is irritated by delays incident to passing through cities and towns.

There is evidence that leaders of urban communities, unless they are located at convenient stopping places along the great arteries of travel, are beginning to realize that the through motorist is not the asset he was once believed to be. At a recent meeting a large delegation of citizens from Ontario and Pomona, in San Bernardino and Los Angeles counties, appeared before the highway commission to urge the establishment of a new State highway route between the two communities, which would eliminate several grade crossings and *TAKE THE THROUGH TRAFFIC AWAY FROM THE BUSINESS DISTRICTS OF THE TWO CITIES.*

Route Opposed in Beginning.

When asked why the route, so obviously the proper one, was not adopted when the highway was originally laid out a decade ago, the delegation replied that both communities had insisted that the highway pass through their business districts, even though it was necessary to cross several railroad lines to do so. The counties interested have agreed to take over the existing highway as a county road, if the new section is built. Upon this showing, the commission directed the State Highway Engineer to investigate and report upon the proposed route.

There is evidence that other communities are coming to the same conclusion as Ontario and Pomona. Through traffic jams business districts and makes it more difficult for local residents and nearby farmers, the real supporters of community progress, to do their shopping and transact their business. The day is coming when centers of population will not oppose locations for arterial routes that will take the highway as far as possible away from business centers.

WHAT COUNTIES' INCOME FOR ROADS FROM STATE SOURCES MEANS IN TERMS OF LOCAL TAX RATES

MANY people in California fail to appreciate the fact that one-half of the state's net income from the present two-cent gasoline tax is divided among the counties; and that, likewise, one-half the income from motor vehicle license fees, less the cost of motor traffic police, is also divided among the counties in proportion to motor vehicle registrations.

The combined income of the fifty-eight counties for road work during 1925 from these two state sources exceeded ten and a half millions.

For those who delve into statistics the accompanying table will prove interesting. It gives the assessed valuation of each county upon which local taxes are levied, the amounts apportioned to each from the state fuel fund and license fees, and the rate necessary in each county to raise a like sum by local taxation.

The importance to the counties of this income is evident from the fact that in twenty-seven a tax in excess of 20 cents per $100 of assessed valuation would be necessary, while in seven a rate of 30 cents or above would be required to raise an amount equal to the state's contribution. The average for the state is .183. The tabulation follows:

Counties	*Total valuation county assessed nonoperative property, 1925*	*Apportioned to counties* *Motor vehicle fees, 1925*	*Fuel tax 1925*	*Total*	*Tax rate per $100 valuation necessary to provide equal revenue*
Alameda	$353,955,912	$243,589 74	$501,982 67	$745,572 41	$0.211
Alpine	714,521	76 33	155 69	232 02	.032
Amador	6,758,127	4,020 45	8,297 55	12,318 00	.182
Butte	36,480,949	26,790 97	55,062 05	81,853 02	.224
Calaveras	7,032,275	3,998 69	8,210 70	12,209 39	.174
Colusa	22,071,355	9,497 28	19,686 97	29,184 25	.132
Contra Costa	88,605,475	38,970 36	82,431 42	121,401 78	.137
Del Norte	10,283,747	2,912 78	5,721 37	8,634 15	.084
El Dorado	10,337,340	5,129 36	10,786 11	15,915 47	.154
Fresno	165,714,637	120,092 14	251,700 12	371,792 26	.224
Glenn	22,894,726	9,784 75	19,524 60	29,309 35	.128
Humboldt	52,406,168	28,230 39	57,336 68	85,567 07	.163
Imperial	42,567,499	41,363 02	86,772 48	128,135 50	.301
Inyo	11,390,515	5,581 79	11,672 72	17,254 51	.152
Kern	180,120,547	71,007 40	149,135 94	220,143 34	.122
Kings	25,088,599	18,760 06	39,128 16	57,888 22	.231
Lake	7,336,840	5,208 28	10,723 45	15,931 73	.217
Lassen	13,400,500	8,043 88	15,251 21	23,295 09	.174
Los Angeles	2,525,067,035	1,375,395 17	2,919,898 75	4,295,293 92	.170
Madera	22,909,600	11,544 05	24,129 67	35,673 72	.156
Marin	25,497,930	18,112 37	36,879 47	54,991 84	.216
Mariposa	4,713,177	1,971 61	4,068 38	6,039 99	.128
Mendocino	25,898,504	14,323 68	29,484 57	43,808 25	.169
Merced	32,612,022	22,733 75	47,926 00	70,659 75	.217
Modoc	7,670,374	3,563 73	7,128 53	10,692 26	.139
Mono	3,084,630	625 60	1,322 23	1,947 83	.063
Monterey	40,182,545	25,638 60	54,193 18	79,831 78	.199
Napa	22,079,343	13,989 06	28,767 58	42,756 64	.194
Nevada	7,065,905	5,611 80	11,125 48	16,737 28	.237
Orange	146,732,680	83,495 06	174,081 82	257,576 88	.176
Placer	15,678,205	16,950 70	34,832 06	51,782 76	.330
Plumas	12,624,992	3,669 77	6,695 83	10,365 60	.082
Riverside	46,121,230	48,970 43	102,768 22	151,738 65	.329
Sacramento	128,361,002	87,955 13	180,493 47	268,448 60	.209
San Benito	13,308,600	8,431 64	17,184 89	25,616 53	.192
San Bernardino	69,033,745	74,785 05	154,653 40	229,438 45	.332
San Diego	100,963,361	121,578 58	258,725 51	380,204 09	.377
San Francisco	733,693,760	267,846 93	557,795 89	825,642 82	.113
San Joaquin	104,620,310	72,649 24	150,728 59	223,377 83	.214
San Luis Obispo	34,464,953	18,687 69	37,850 55	56,538 24	.164
San Mateo	42,062,670	34,422 04	72,106 08	106,528 12	.253
Santa Barbara	60,567,709	41,809 46	89,077 27	130,886 73	.216
Santa Clara	107,985,290	94,934 45	197,431 08	292,365 53	.271
Santa Cruz	22,442,480	26,118 57	53,749 91	79,868 48	.356
Shasta	16,940,710	11,620 51	23,701 79	35,322 30	.209
Sierra	2,892,010	1,397 21	2,699 33	4,096 54	.142
Siskiyou	21,072,870	16,256 90	32,281 65	48,538 55	.230
Solano	30,787,420	23,663 65	48,317 38	71,981 03	.234
Sonoma	43,514,670	48,297 64	98,885 67	147,183 31	.338
Stanislaus	53,830,075	47,647 54	98,233 53	145,881 07	.271
Sutter	17,853,325	10,693 00	21,783 76	32,476 76	.182
Tehama	17,165,960	10,507 54	21,574 21	32,081 75	.187
Trinity	3,395,927	1,063 50	2,012 74	3,076 24	.091
Tulare	67,763,250	57,282 05	120,351 87	177,633 92	.262
Tuolumne	8,850,745	6,634 93	14,063 37	20,698 30	.234
Ventura	54,556,749	31,298 07	66,796 88	98,094 95	.179
Yolo	26,966,854	17,864 32	37,267 45	55,131 77	.204
Yuba	16,578,575	9,512 29	19,503 61	29,015 90	.175
Totals	$5,794,770,924	$3,432,610 98	$7,194,051 54	$10,626,662 52	*$0.183

*Average per County.

TRAFFIC ON CALIFORNIA HIGHWAYS CONTINUES TO INCREASE

SUMMER COUNTS FOR INTERSTATE ROUTES TABULATED

COUNTS of traffic taken periodically by the maintenance department of the state highway organization are studied as a guide to the allotment of money for maintenance purposes. Data thus gathered also are available for the use of the other departments in planning the design and construction of highways that will be adequate for probable future traffic.

The first comprehensive study of traffic throughout the state was made in 1920 by the United States Bureau of Public Roads and the California Highway Commission with the cooperation of a number of the counties. This wark continued in 1922 and, in 1924, was taken over by the commission. Since that time counts have been made at regular intervals.

The practice has been, generally, to take counts from 6 a.m. to 10 p.m., for two-day periods. The last count made was on July 18th and 19th of this year, at some 430 strategic points throughout the state. The count is generally taken on Sunday and Monday, which are, on most roads, the high and law days for the week. The sixteen hour period has been found to cover more than 90 per cent of the traffic.

A comparison of totals indicates that the rate of increase for 1926 is somewhat lower than for preceding years. The drop recorded at some points may be partially accounted for by the fact that construction work was in progress nearby, or because improvement of adjacent roads has provided additional traffic arteries. Some of the increases over the 1925 count between various terminii are as follows:

Red Bluff to Woodland Wye.....12 per cent
Fairfield to Benicia.....9 per-cent
Sacramento to Woodland Wye.....10 per cent
San Francisco to San Jose..... 8 per cent
Santa Monica to Seal Beach..... 9 per cent
San Bernardino to El Centro.....28 per cent

Taking the 1924 figures as a base, it is found that, in 1925, traffic increased throughout the state by 17 per cent over the previous year. The 1926 totals show an increase of 22 per cent over the 1924 count.

Interstate Traffic.

Much has been conjectured about interstate traffic in California. A table below gives the figures for 1924 and 1926 at the nine most important border stations. These counts show the Pacific Highway and the Borderland route carrying the heaviest interstate traffic. The larges number of foreign cars (cars with other than California license) crossing the border of the state was at Yuma on Sunday, July 18th. A count over a long period might show different averages than here indicated, but the figures generally will give the trend of traffic at the peak of the summer season.

CALIFORNIA HIGHWAY COMMISSION

TRAFFIC COUNT—IMPORTANT BORDER STATIONS—16 HOURS—1924 AND 1926

ROUTE AND LOCATION OF CHECKING STATION	1924						1926					
	Thursday, July 17.			Friday, July 18th.			Sunday, July 18th.			Monday, July 19th.		
	All vehicles	Trucks and busses	Foreign cars	All vehicles	Trucks and busses	Foreign cars	All vehicles	Trucks and busses	Foreign cars	All vehicles	Trucks and busses	Foreign cars†
Roosevelt Highway—Route 71												
At Oregon line	No Count			No Count			279	16	48	227	26	47
Redwood Highway—Route 1												
At Oregon line	No Count			No Count			369	20	168	424	98	173
Pacific Highway—Route 3												
At Oregon line	1,076	11	331	897	13	275	1,434	41	312	1,178	40	308
Susanville-Reno highway												
Route 29—At Doyle	101	8	32	96	4	19	213	10	47	134	15	31
*Victory Highway												
(Truckee River route) Route 38												
At Nevada line	363	4	227	151	2	52	928	8	633	555	4	324
Arrowhead Trail												
(Silver Lake Cut Off) Route 31												
At Nevada line	No Count			No Count			106	20	46	109	20	45
National Old Trails												
(Needles Route) Route 58												
Near Arizona Border	90	....	41	160	....	45	220	8	101	244	13	112
Mecca-Blythe Highway—Route 64												
At Arizona line	No Count			No Count			116	2	....	101	....	....
Borderland Highway—Route 27												
Colorado River opposite Yuma	No Count			No Count			1,415	124	749	1,282	156	562

*This count does not include traffic at Nevsda line on Dog Valley grade, or traffic on state routes touching Nevada line on north and south shores of Lake Tahoe, a part of which is interstate.

†Foreign cars are all vehicles other than those carrying California license.

Motor Vehicle Registration For 1926 Shows Gain; Fees Apportioned to State and Counties

MOTOR vehicle registrations and the income from license fees for the first six months of 1926, as recently announced by the California Division of Motor Vehicles, indicate that the total for the year will reach the estimates of the Highway Investigating Committee, as set forth in its report. Actual registrations to June 30th reached a total of 1,549,093 vehicles, while the committee's estimate for the year is 1,610,000. It is even probable that this figure may be exceeded by December 30th next.

The last legislature changed the registration year to make it coincident with the calendar year. The total registration on June 30th this year was 166,272 in excess of the registration on July 31st of 1925.

Statement of total number of fee paid registrations of automobiles, trucks, motorcycles, and trailers for January 1, 1926, to June 30, 1926:

County	Autos	Solid Trucks	Pneumatic Trucks	Motorcycles	Trailers
Alameda	95,442	2,821	10,425	887	980
Alpine	36	-----	3	1	1
Amador	1,478	50	240	2	7
Butte	9,687	241	1,343	59	364
Calaveras	1,453	65	256	7	35
Colusa	3,311	104	480	13	145
Contra Costa	15,386	424	1,743	215	189
Del Norte	918	41	223	3	16
El Dorado	1,713	70	350	14	10
Fresno	41,324	1,477	5,011	288	2,026
Glenn	3,405	107	423	25	304
Humboldt	10,340	334	1,346	54	73
Imperial	14,797	342	2,849	39	338
Inyo	2,025	37	265	5	33
Kern	25,312	750	3,382	163	962
Kings	6,499	192	803	34	574
Lake	1,935	101	304	2	27
Lassen	2,994	41	352	16	21
Los Angeles	511,295	14,723	54,297	2,730	6,691
Madera	4,119	120	584	22	161
Marin	6,868	238	1,168	49	28
Mariposa	715	32	162	3	10
Mendocino	5,094	231	880	23	37
Merced	8,016	240	1,241	63	412
Modoc	1,311	19	155	3	7
Mono	258	3	32	----	-----
Monterey	9,520	339	1,535	71	251
Napa	5,188	243	733	57	91
Nevada	2,089	62	381	7	13
Orange	30,830	597	3,293	221	1,309
Placer	5,921	189	1,133	41	93
Plumas	1,347	49	239	3	16
Riverside	18,297	310	2,688	129	915
Sacramento	30,743	1,131	4,774	292	711
San Benito	3,061	97	414	28	68
San Bernardino	27,997	578	3,830	220	849
San Diego	46,406	996	5,784	619	558
San Francisco	96,720	4,990	13,393	858	466
San Joaquin	24,914	816	3,919	232	1,073
San Luis Obispo	6,983	171	1,094	37	149
San Mateo	13,268	598	1,877	104	165
Santa Barbara	15,164	369	2,225	124	216
Santa Clara	34,995	1,332	4,453	407	1,315
Santa Cruz	9,692	364	1,425	114	141
Shasta	3,625	173	636	13	78
Sierra	516	14	102	1	3
Siskiyou	6,030	128	748	20	30
Solano	8,525	284	1,176	76	136
Sonoma	17,002	686	3,540	142	248
Stanislaus	16,690	375	2,203	159	1,267
Sutter	3,780	212	733	15	126
Tehama	3,597	88	532	21	219
Trinity	390	9	62	----	2
Tulare	20,284	625	2,716	115	1,527
Tuolumne	2,268	59	317	13	19
Ventura	11,690	264	1,578	58	516
Yolo	6,314	245	1,005	43	261
Yuba	3,284	94	584	8	71
TOTALS	1,262,841	39,290	157,439	8,968	26,353
City County and State	10,931	Exempt from Fees		303	691
Public Service	7,785	Exempt from Fees		45	1,453
United States	1,067	Exempt from Fees		12	30
Dealers' Plates	11,756			148	68
Nonresidents	19,913				

Total Number of Vehicles--1,549,093.

Apportionment of Motor Vehicle fees to counties for period beginning January 1, 1926, and ending June 30, 1926:

County	County Share	Traffic Officers Salaries Paid for First One-half Year	Traffic Officers Salaries Reserved for Second One-half Year	Net Apportionment to County
Alameda	$213,734 17	$10,017 16	$10,380 00	$193,337 01
Alpine	79 32	----------	----------	79 32
Amador	3,435 53	----------	----------	3,435 53
Butte	22,601 77	4,125 00	4,500 00	13,976 77
Calaveras	3,512 92	----------	----------	3,512 92
Colusa	7,838 27	1,500 00	1,500 00	4,838 27
Contra Costa	34,713 18	6,985 32	7,560 00	20,167 86
Del Norte	2,321 32	1,570 17	751 15	----------
El Dorado	4,164 81	1,137 50	1,350 00	1,677 31
Fresno	96,918 36	10,467 89	13,860 00	72,590 47
Glenn	8,248 37	1,950 00	1,950 00	4,348 37
Humboldt	23,485 81	6,390 00	6,390 00	10,705 81
Imperial	35,492 76	11,001 24	12,270 00	12,221 52
Inyo	4,574 90	----------	----------	4,574 90
Kern	59,042 40	12,451 73	14,130 00	32,460 67
Kings	15,655 27	2,773 38	3,090 00	9,791 89
Lake	4,580 71	1,920 00	1,920 00	740 71
Lassen	6,619 59	1,983 34	3,300 00	1,336 25
Los Angeles	1,140,132 26	----------	----------	1,140,132 26
Madera	9,670 17	1,650 00	1,650 00	6,370 17
Marin	16,152 41	5,386 87	5,460 00	5,305 54
Mariposa	1,783 54	374 20	1,200 00	209 34
Mendocino	12,107 54	6,270 00	4,500 00	1,337 54
Merced	19,270 70	5,877 48	7,200 00	6,193 22
Modoc	2,891 96	----------	----------	2,891 96
Mono	566 78	----------	----------	566 78
Monterey	22,646 26	6,525 00	6,900 00	9,221 26
Napa	12,206 20	1,913 23	2,250 00	8,042 97
Nevada	4,930 84	1,800 00	1,800 00	1,330 84
Orange	70,070 53	12,060 59	16,050 00	41,959 94
Placer	14,262 48	4,200 00	4,200 00	5,862 48
Plumas	3,197 60	----------	----------	3,197 60
Riverside	43,185 95	8,741 57	9,150 00	25,294 38
Sacramento	72,745 84	5,850 00	5,850 00	61,045 84
San Benito	7,091 59	3,110 00	3,750 00	231 59
San Bernardino	64,717 99	----------	----------	64,717 99
San Diego	105,118 37	22,207 50	22,770 00	60,140 87
San Francisco	225,106 64	----------	----------	225,106 64
San Joaquin	59,821 97	7,255 44	8,070 00	44,496 53
San Luis Obispo	16,303 30	5,400 00	5,400 00	5,503 30
San Mateo	30,962 34	8,604 83	9,600 00	12,757 51
Santa Barbara	34,989 80	8,250 00	8,250 00	18,489 80
Santa Clara	82,174 20	12,430 00	12,000 00	57,744 20
Santa Cruz	22,686 89	----------	----------	22,686 89
Shasta	8,743 58	2,900 00	3,150 00	2,693 58
Sierra	1,230 29	----------	----------	1,230 29
Siskiyou	13,444 22	4,161 86	4,350 00	4,932 36
Solano	19,713 68	4,350 00	4,350 00	11,013 68
Sonoma	41,800 90	5,250 00	5,400 00	31,150 90
Stanislaus	39,999 96	4,954 84	5,700 00	29,345 12
Sutter	9,405 15	3,900 00	3,900 00	1,605 15
Tehama	8,613 98	4,500 00	4,113 98	----------
Trinity	893 70	----------	----------	893 70
Tulare	48,838 33	7,660 93	10,680 00	30,497 40
Tuolumne	5,176 51	1,200 00	1,200 00	2,776 51
Ventura	27,267 60	5,495 91	5,580 00	16,191 69
Yolo	15,212 29	2,700 00	2,700 00	9,812 29
Yuba	7,817 00	2,100 00	2,100 00	3,617 00
TOTALS	$2,889,970 80	$251,352 98	$272,225 13	$2,366,392 69

Net amount to Highway Commission first half, 1926, $2,889,970.80.

One man tree watering outfit in operation in Division VI. Tractor tank arrangement is development of the division. Pipe for carrying water to trees is operated from driver's seat.

Teacher—"Use the right verb in this sentence—'The toast was drank in silence.'"

Pupil—"The toast was ate in silence."—Exchange.

STRAIGHT FROM THE CHIEF

(Continued from page 2.)

owners to convert the State highway into a main boulevard, with sufficient width to accommodate the multitudinous traffic supposed to react to increase frontage values. In planning the subdivision, property owners willingly establish set back lines so as to provide for a wide boulevard, and the width of the highway is increased from 60 to 80, 100 or even 120 feet, depending on the magnitude of the vision which the owner has for the future of his property.

In several locations where the widths originally established were seriously cramping the expansion of the road to take care of increased traffic, subdividers have cooperated with the Division Engineers in dedicating more width for the State highway. Notable examples of this exist on Route 2 between San Mateo and San Jose. Several subdividers have set back their lines on one side to give 40 feet as a half width for the street eventually to be built.

Between Hollywood and Calabasas, in Los Angeles County, the evolution of the old, narrow country road to a modern city

Cooperation by subdividers. *Above,* Ventura boulevard north of Los Angeles, 90 feet between curbs; *Center,* subdivision line set back on south side of original right of way, present pavement at right; *Below,* view on highway in same locality where subdivision has not yet taken place. More room needed.

street is very apparent. For long distances, subdividers have voluntarily increased the width of the State highway, and have thereby added greatly to the attractiveness of their properties, and have provided as well for future heavy traffic by setting aside width enough to permit wide street and sidewalk construction.

Engineers Should Watch Changes.

Our organization should be alive to the possibilities presented by the psychology of the situation. Land is usually subdivided into lots adjacent to the cities, and the resultant settlement causes an increase in local traffic which the former State highway width does not provide for. Through cooperation of subdividers, much can be accomplished to obtain the increased width now known to be necessary for our State highways. Many county boards of supervisors also have agreed to cooperate by not accepting maps of subdivisions fronting on the highway until they have the approval of the State highway authorities.

Our engineering organization, constantly traveling back and forth over the roads, should be alive to subdivision projects, and should diligently follow up the surveys in an effort to demonstrate to property owners the desirability of setting aside the increased width necessary for the future.

ARIZONA BANKER TELLS OF FAITHFUL WORK AT SAND HILLS

THE FAITHFULNESS of a California highway engineer and the untiring efforts of the contractors who had charge of the Sand Hills paving project, in Imperial County, moved Emil C. Eger, Yuma, Arizona, banker, to voice his commendations in a letter to State Highway Engineer R. M. Morton. Because of the heat of the desert the work progressed under extremely trying conditions, as pointed out by Mr. Eger. His letter follows:

> With reference to the paving on the Sand Hills near Yuma, the writer is moved to call attention to the efficient manner in which this work has been handled and the untiring labors of the engineer in charge, Mr. Baker, as well as of the contractors Schmidt and Hitchcock. Under conditions trying in the extreme, with the thermometer around 125 degrees, there being no shade, the results are truly remarkable.
>
> The writer has had occasion to know that Mr. Baker left for the work morning after morning shortly after daylight, returning at dusk. This in itself may not be unusual, but at this season of the year, in Yuma, it is.
>
> The execution of the work—no less important than the fine ability displayed in its planning—leaves a monument, of which the California Highway Commission may well be proud; and work well performed should not go without praise, lest the fine incentive displayed be taken as a matter of course.

Yuma Chamber Comments.

The Yuma Chamber of Commerce has added its comments upon the new Sand Hills highway. L. W. Alexander, secretary, writes to Chairman Harvey M. Toy as follows:

> I have been directed by the Yuma Chamber of Commerce to write to you and your able staff and submit their compliments covering the paving and completion of the highway through the Sand Hills which are located between Yuma and Holtville. This stretch of road was overcome by the California Highway Department when engineers said it was impossible.
>
> It is a most excellent piece of work and a wonderful road which will make it possible for tourists and all travelers who use our highways to enter your beautiful state with a degree of comfort, which in the past has been a dread and somewhat of a hardship, and at the same time view one of the wonders of the world in this vast expanse of sand located in the State of California.
>
> We also feel that the completion of this road is of great importance to Yuma and a great asset and I have also been directed to extend to you the sincere thanks of the entire community for your consideration in making it possible for this work to be advanced and this road completed.

DIVISION IV TELLS OF BATTLES WITH DUST PROBLEM

By R. P. Duffy, Maintenance Engineer, Division IV.

EXTENSIVE experiments have been carried on in Division IV over a considerable period in an effort to find an economical means of combating the dust nuisance on unpaved roads, of which there are approximately 140 miles in the Division. The Skyline Boulevard, leading south along the coast from San Francisco, for example, has a crushed rock surface and is graded to widths of 30 and 40 feet. Counts of traffic on this road over a sixteen hour period on Sunday, July 18th, 1926, showed a total of 11,992 vehicles passing Station 55-1, and 5,707 at Station 55-2-A.

To handle such traffic over unpaved roads without controlling dust is a serious problem. As early as 1922 Division IV began experiments with calcium chloride as a dust preventive, when it was tried on two miles of graveled road on Route 8, in Sonoma County, and on a mile on Route 14 in Contra Costa County. The following season calcium chloride was applied to heavier traveled gravel and crushed rock roads with varying success. In locations where humidity was low, the results were far from satisfactory, and studies were begun in an effort to find a more satisfactory and economical method.

Further Experiments Tried.

In June, 1924, a section of the Pacheco Pass road, Route 32, between Stations 140 and 146, was treated with fuel oil for a width of 21 feet, at the rate of 1/9 gallon per square yard of surface; and, in August, the adjoining section between Stations 130 and 140 was treated with magnesium chloride, which was furnished for the experiment without cost by the Leslie Salt Works of Redwood City.

Observation of both palliatives indicated that, under the conditions encountered, the fuel oil was the more effective. This influenced a decision to try fuel oil during the 1925 season.

After considerable thought and study, it was decided to apply to the mulch surface of the road a fuel oil of low asphaltic content at the rate of 1/3 gallon per square yard, per season, in three applications of 1/9 gallon each. The first application was made in May. Subsequent applications were made as the roads became dusty.

Preceding each application of oil the mulch was evenly distributed over the road surface, which was again dragged immediately after the oiling to thoroughly mix the mulch with the oil. This treatment gave traffic a practically dustless road during the time the oil was active. The period between applications varied with climatic conditions but was generally from five to seven weeks.

Method of Applying Oil.

Oil was applied under pressure by an asphaltic oil truck distributor, which cavered from five to twelve miles of 21-foot roadway daily, depending upon the necessary length of haul of the oil.

The cost of this type of work varied with the market price of oil and the freight rate to the various destinations. A fair average for Division IV would be approximately $100 per mile for an application of 1/9 gallon per square yard, or about $300 per mile per season.

The 1925 fuel oil experiments were so successful it was decided to follow the same plan during the 1926 season.

Plan Followed During 1926.

In order to obtain a more lasting effect, we have, this season, made heavier applications of fuel oil containing a high percentage of asphalt. On 5.5 miles of the Skyline Boulevard ½ gallon per square yard was applied in two equal applications of ¼ gallon each.

Applications of asphaltic road oils also have been made to the broomed base of graveled or crushed rock roads. One ¾ mile stretch on Route 22, in Santa Clara County, wa streated in June, 1925, with Gilmore 90-95 road oil at the rate of 0.40 gallons per square yard, and about one mile on Route 14, in Contra Costa County, just south of Rodeo, was treated with Grade E asphalt of 200 to 250 penetration at the rate of 0.45 gallons per square yard.

OILING OPERATIONS, DIVISION IV—*Above,* placing application of oil on section of Pacheco Pass lateral. *Below, left,* dust prior to oiling; *Right,* car traveling at rapid rate few days after work completed; no dust. (Photos by Division IV.)

Both of these sections now have the appearance of an oil macadam pavement, and since their treatment little maintenance has been necessary on the traveled highway .

Participation in World Road Congress Authorized by Senate.

A joint resolution to authorize the Secretary of Agriculture to accept membership for the United States in the Permanent Association of the International Road Congresses was adopted by the House of Representatives early in the summer.

This is seen to be one of the moves which will help road development throughout the world, a movement which will assure the United States a continuation of its leadership in highway building influence as well as in motor car manufacturing.

"Now that you've see my son and heir," said the proud young father, "which side of the house do you think he resembles?"

"Well," said his astonished bachelor friend, "his full beauty isn't developed yet, but surely you don't suggest that he—er—looks like the side of a house, do you?"—Exchange.

WHAT THE DIVISIONS ARE DOING

DIVISION III.

HEADQUARTERS, SACRAMENTO.

F. W. HASELWOOD, DIVISION ENGINEER.

Counties of Butte, Colusa, El Dorado, Glenn, Nevada, Placer, southern Plumas, Sierra, Sutter, Yuba, and northern Sacramento and Yolo.

ON SEPTEMBER 18th, Clark and Henery completed the 1.14 miles of asphaltic concrete pavement on Del Paso boulevard in North Sacramento. This boulevard is 100 feet wide. Sidewalks are 12 feet wide, leaving 76 feet for roadway. Early this summer curbs, gutters and sidewalks were completed by the city of North Sacramento. The central 30 feet was paved by the state and the side strips by the municipality, both jobs being done by Clark and Henery.

The new pavement connects with the 30-foot concrete pavement placed last winter from the American River bridge to the city limits of North Sacramento, and together with it constitutes one of the most notable improvements on the entrances to Sacramento. The cost of the completed pavement was approximately $85,000, of which the state paid approximately $29,000 and the city $56,000. Clyde W. Rust was resident engineer for the entire project.

Oiling Brings Improvement.

The road between Donner Lake and Truckee has been improved with a surfacing of crushed rock bound with asphaltic oil. Through the town of Truckee this surfacing is 40 feet wide and has the appearance of an asphalt pavement.

Similar surfacing has been completed on the Ukiah-Tahoe route from Marysville easterly for five miles. Yuba County cooperated with the state on this latter project.

Work for the season of 1926 has been completed on the construction of 3.5 miles of new grade leading from Nevada City to the top of Harmony ridge. This work is being financed jointly by Nevada County and the state.

DIVISION VI.

HEADQUARTERS, FRESNO.

E. E. WALLACE, ACTING DIVISION ENGINEER.

Counties of Fresno, Madera, Merced, Mariposa, Kings, Tulare, and Kern, north of the Tehachapi.

THE California Road and Street Improvement Company has been awarded the contract for widening with asphaltic concrete, a section of Route 4 between Church and Cherry avenues, Fresno.

The Allied Contractors, Incorporated, of Colorado were awarded the contract for concrete shoulders, asphaltic concrete top and rock borders on Route 4, in Merced County, between Chowchilla River and Merced.

Division VI has been using a Killifer disc on rough asphalt pavements. A vialog reading on a seventeen-mile section showed 18.5 inches per mile of roughness, which compares favorably with many new pavements. A two-ton caterpillar tractor equipped with a rubber track provided the motive power for operating the disc.

South of Bakersfield, the maintenance forces of the Division have been using a Wheeler planer to reduce the ridge which formed against the concrete shoulder by reason of the excess of high-penetration asphalt used in the old asphalt surfacing and seal coat. The material removed is deposited outside the concrete shoulder where it forms an oil shoulder from one to two feet in width.

A tractor and "A" frame have been used for unloading crushed rock for shoulder work at Kingsburg. The maintenance department reports the unloading has been done for 12 cents a ton.

DIVISION VII.

HEADQUARTERS, LOS ANGELES.

S. V. CORTELYOU, DIVISION ENGINEER.

Counties of Los Angeles, Ventura, Orange, San Diego, and eastern Kern, south of Mojave.

ON THE Coast highway, north of Ventura, work of removing the "Long Causeway", 4,448 feet in length, has been completed by maintenance forces. Work is now in progress on the removal of the westerly Causeway, the Rincon seawalls having been completed. It has been necessary to cut this trestle longitudinally, removing half at a time, the traffic being carried on the southerly part under a one-way control.

Work has commenced on the contract for the construction of five miles of highway to be graded and paved with concrete between Oxnard and Hueneme Road, on the ocean front route. Along the coast, easterly from Oxnard, in the vicinity of Point Mugu, a maintenance crew, equipped with two power shovels and dump trucks, is removing slides and quarrying and placing rip-rap rock to protect the highway from wave action.

Coast Route Section Open.

The new Coast highway between Newport and Laguna is now completed except for the construction of rock shoulders, which work is now well under way. Traffic has been using the new road for several weeks.

Collapsible warning sign in use in several of the divisions. It works on hinges and, if struck by a passing vehicle, is easily knocked down. There is little danger of damage such as sometimes results when more rigid signs are used.

The dangerous grade crossing just north of Oceanside, San Diego County, is a thing of the past. Traffic is now using the new underpass under the tracks of the Santa Fe railroad. The new line also eliminates several bad curves. This work is a part of the recently completed John and Bressi contract for widening and thickening the Coast highway between Oceanside and San Onofre.

DIVISION IX.

HEADQUARTERS, BISHOP.

F. G. SOMNER, DIVISION ENGINEER.

Counties of Inyo, Mono, and eastern Kern County, north of Mojave.

SURFACING work between Red Rock Canyon and Little Lake, under contract to Harry Wilson and Gallaway and Vozz, has been completed.

A crushing plant is being installed on the four-mile section of road recently graded between Manzanar and Lone Pine, Inyo County. The city of Los Angeles is erecting a steel structure at the crossing of the aqueduct on this section.

Work has been started by state forces on the relocation project in Long Valley between McGee Creek and Convict Creek, Mono County.

Oiling of thirty miles of road in Owens Valley including the main streets of Bishop, Big Pine, Independence, and Lone Pine is about completed.

Surveys have been completed on the relocation between Dogtown and Point Ranch, in Mono County, and construction by state forces will soon be commenced.

A contract has been awarded Grant T. Johnson for the construction of a shop building and garage at the Bishop maintenance yard. The contract also includes truck sheds, pumping plant and oil house, and a general remodeling of the plant.

DIVISION X.

Headquarters, SACRAMENTO.

R. E. PIERCE, Acting Division Engineer.

Counties of Amador, Calaveras, Alpine, Tuolumne, Stanislaus, San Joaquin, Solano, and southern Sacramento and Yolo counties.

EXCELLENT progress is being made on the laying of asphalt concrete surfacing on the Modesto-Stanislaus River reconstruction project. This job is being done by the Valley Paving and Construction Company of Visalia. J. W. Cole is resident engineer, who has A. K. Nulty and J. D. Greene as assistants.

H. Brown, contractor, has started work on the 30 foot concrete pavement through the new subway to the M Street bridge at West Sacramento. C. A. Potter is resident engineer and G. C. Harden, assistant.

The survey, financed by Solano and Napa counties of the proposed new highway through the American canyon from the Carquinez Straits bridge to Cordelia, is nearly completed. H. F. Balsz is acting chief of party in charge.

Oiling Operations Under Way.

Division X has commenced oiling roads (Oregon type) in Amador County at a point about three miles west of Ione. Continuation of the work from this point to Jackson is planned. H. S. Clark, maintenance foreman, is in charge. The oil being used is a 65 per cent asphalt content product obtained from the Gilmore Oil Company of Los Angeles.

HIGHWAY NEWS NOTES

CHAIRMAN Harvey M. Toy of the commission has returned to his home in San Francisco from Hawaii where he enjoyed a vacation of several weeks.

Commissioner Louis Everding recently returned from a motor trip to Yellowstone National Park.

W. A. Smith of Division III has been appointed assistant to Acting Maintenance Engineer T. H. Dennis, succeeding C. H. Blood, resigned.

E. K. Guion, formerly assistant in the Department of Surveys and Plans, has succeeded Mr. Smith as office engineer of Division III.

Miss Ruth Miles has returned to her former position of Chief Stenographer, Division X, after an extended leave of absence during which she visited England and the continental countries.

Miss Charlotte Barnes of the Purchasing Department has announced her engagement to Mr. Henry Mahoney of the Accounting Department, headquarters. The wedding will be an event of the near future. The headquarters staff recently presented the couple with a beautiful silver set.

R. A. Westbrook, assistant resident engineer, Division VI, has been transferred to Division V.

A. N. George, well known member of the Division VII staff, is the proud father of A. N. George, Jr., his first son.

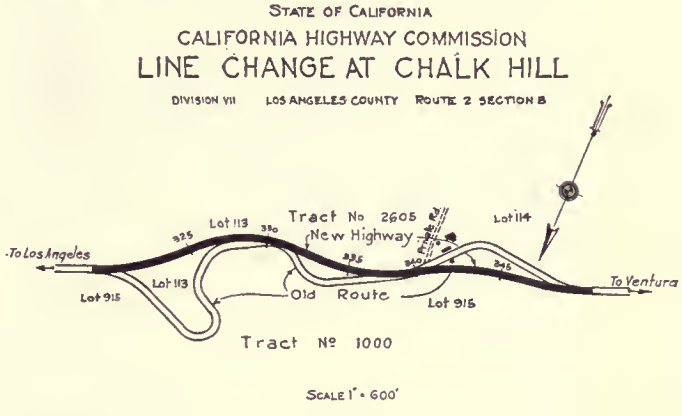
New highway on new alignment and grade over Chalk Hill, Coast route, Los Angeles County. Portion of old grade may be seen in upper left of view. (Photo by Div. VII.)

CHALK HILL BARRIER NO MORE

CHALK HILL, the last barrier to fast traffic out of Los Angeles over the Ventura boulevard (Coast State highway), has been removed with the opening to travel of the new line and grade over this elevation, recently completed under the direction of Division VII. Grades have been considerably reduced by a heavy cut at the summit and several dangerous curves have been removed, as shown by the map of the improvement.

Along the new route a roadway, 40 feet wide, was graded and a 24-foot bituminous macadam pavement constructed. The cost of the line change, seven-tenths of a mile in length, was approximately $45,000.

H. A. McCray of Los Angeles was the contractor. R. D. Kinsey, assistant resident engineer, supervised construction for the state.



News from Division III.

Miss Lucille Steers has returned to work after a prolonged illness.

Clyde W. Rust is temporarily in charge of the grading and surfacing between Sportsman's Hall and Riverton in the place of J. L. Piper, who is ill.

R. K. Forrest, formerly superintendent of maintenance and construction work in Division III, has been transferred to the Maintenance Department.

C. H. Weeks, chief of party, has taken over the maintenance work on the Placerville road formerly directed by Mr. Forrest.

Since the transfer of Mr. Dennis to the central office, the duties of Maintenance Engineer in Division III have been carried on by J. W. Vickrey, in addition to his duties as assistant on construction and location.

STATE HIGHWAY FUND CONTRACTS (Bond Funds, Including Federal Aid)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE AUG. 16, 1926.						
468	III	Nevada	38	B	Across Truckee River, near Hinton		Concrete Girder Bridge	McKay Engr. Co.	$37,902 15	June 3, 1925	------
495	VI	Mariposa	18	E, F	Across Slate Gulch and Sweetwater Creek		Two Earth-filled Arch Span Bridges	Noble Bros.	23,046 75	Mar. 17, 1926	------
					AWARDED SINCE AUGUST 16, 1926—NONE.						
					PENDING AWARD—NONE.						

NOTE.—Primary construction covered by the above contracts does not include funds obligated on cooperative forest highway projects, prison camp road activities, or day labor jobs not being done under contract.

STATE HIGHWAY MAINTENANCE FUND CONTRACTS (Including Gasoline Tax Fund)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE AUG. 16, 1926.						
M-90	IV	Sonoma	1	B	Healdsburg to Santa Rosa	14.16	P. C. Concrete Pavement	J. V. Galbraith	585,146 17	June 17, 1925	------
M-106	VII	Ventura	2	B, C	Camarillo to Ventura	13.19	P. C. Concrete Pavement	H. H. Peterson	447,947 59	Nov. 13, 1925	------
					AWARDED SINCE AUGUST 16, 1926.						
M-138	V	Monterey	2	D	Across Salinas River, 1 mile south of Soledad		Refloor, Clean, and Paint Steel Bridge	Atlas Construction Co.	$47,319 63	Aug. 28, 1926	150
M-139	VII	Los Angeles	2	D	Btw. Michigan Ave., Whittier and Southerly Boundary	3.22	P. C. Concrete Pavement	George Herz and Co.	204,068 87	Aug. 28, 1926	150
M-140	VI	Fresno	4	B	Btw. Church Ave. and Cherry Ave.	0.60	Asph. Conc. Surface and Widening	Calif. Road and St. Imp. Co.	20,975 47	Aug. 28, 1926	75
M-141	VI	Merced	4	A	Btw. Merced and the southerly boundary	14.33	P. C. C. Widening and Asph. Conc. Surface	Allied Contractors, Inc.	185,909 84	Aug. 28, 1926	200
M-142	V	Santa Barbara	2	H, J	Btw. Carpinteria and Summerland	4.5	P. C. Concrete Pavement	Sam Hunter	284,201 66	Sept. 14, 1926	200
M-143	II	Shasta	3	C	Across Dog Creek, about 1 mile south of Delta		Concrete Girder Bridge	E. M. Bordwell and G. E. Brugge	123,890 63	Sept. 14, 1926	225
M-144	IV	Marin	1	B	Through Ross and Larkspur	2.46	Asph. Conc. Surface and Widening	Pacific States Construction Co.	87,938 01	Sept. 14, 1926	90
M-145	VI	Mariposa	16	E	Across Bear Creek, about 3 miles south of Briceburg		Concrete Girder Bridge	Noble Brothers	11,123 44	Sept. 14, 1926	100
M-146	II	Tehama	3	D	Sacramento River Bridge		Refloor and Paint Bridge	D. E. Burgess	6,390 00	Sept. 14, 1926	100
					Sub-total	25.11			$965,427 55		
					PENDING AWARD.						
------	IV	San Mateo	2	A	Colma to Cypress Lawn Cemetery	1.51	Grading		$128,262 24		
------	IV	Contra Costa	14	B	Btw. El Ciervo and Valona	1.8	Grading and Standard Surfacing		211,522 77		
------	II	Shasta	------	------	Boulder Creek Maintenance Station		Foreman's Cottage, Bunk House, etc.		9,104 19		
------	II	Trinity	------	------	Douglas City, Maintenance Station		Foreman's Cottage, Truckshed, etc.		8,545 33		
					Total State Highway Maintenance Fund Contracts Awarded and Pending Award	28.42			$1,329,252 08		

NOTE.—The above obligations charged against the State Highway Maintenance Funds do not include funds from these sources obligated for general maintenance and for specific betterments being done under day labor authorization.

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CALIFORNIA HIGHWAYS

A BULLETIN ISSUED BY THE CALIFORNIA HIGHWAY COMMISSION FOR THE INFORMATION OF ITS EMPLOYEES AND THE PUBLIC

Vol. 3 OCTOBER, 1926 No. 10

DEATH TRAP ELIMINATED—Former grade crossing on the Coast highway near Oceanside, San Diego County, and new subway which has taken its place. See article on page three.

In this issue: SAFETY BUILT INTO RECONSTRUCTION PROJECT—AIMS OF THE MAINTENANCE DEPARTMENT—LABORATORY EXPERIMENTS WITH BINDER MATERIALS FOR GRAVEL AND CRUSHED ROCK ROADS.

CALIFORNIA HIGHWAYS

This Bulletin is published by the California Highway Commission for the information of its employees and the public. Editors of newspapers and others interested are welcome to use, without restriction, any of the matter herein contained. Cuts will be gladly loaned upon request.

FRANK B. DURKEE - - - Editor
P. O. Box 1103, Sacramento, California.

Vol. 3 OCTOBER, 1926. No. 10

CALIFORNIA HIGHWAY DEPARTMENT

FRIEND WM. RICHARDSON, Governor.

CALIFORNIA HIGHWAY COMMISSION

HARVEY M. TOY, Chairman, San Francisco

N. T. EDWARDS, Commissioner, Orange
LOUIS EVERDING, Commissioner, Arcata

R. M. MORTON, State Highway Engineer, Sacramento

PAUL F. FRATESSA, Attorney, San Francisco

W. F. MIXON, Secretary, Woodland

HEADQUARTERS STAFF, SACRAMENTO

T. E. STANTON, Assistant State Highway Engineer

L. V. CAMPBELL, Office Engineer

FRED J. GRUMM, Engineer of Surveys and Plans
HARLAN D. MILLER, Bridge Engineer

C. S. POPE, Construction Engineer
R. H. STALNAKER, Equipment Engineer

T. H. DENNIS, Acting Maintenance Engineer
C. L. McKESSON, Materials and Research Engineer

BEN H. MILLIKEN, Superintendent of Prison Road Camps

HERMAN B. WEAVER, Chief Accountant
LOWELL R. SMITH, Purchasing Agent

DIVISION ENGINEERS

T. A. BEDFORD, Division I, Willits

H. S. COMLY, Division II, Redding

F. W. HASELWOOD, Division III, Sacramento

J. H. SKEGGS, Division IV, San Francisco

L. H. GIBSON, Division V, San Luis Obispo

E. E. WALLACE (Acting), Division VI, Fresno

S. V. CORTELYOU, Division VII, Los Angeles

E. Q. SULLIVAN, Division VIII, San Bernardino

F. G. SOMNER, Division IX, Bishop

R. E. PIERCE (Acting), Division X, Sacramento

General Headquarters, Fifth Floor, Forum Bldg., Sacramento, California.

ARE THE MAINTENANCE ENGINEERS AND FOREMEN PLAYING FAIR ON EQUIPMENT MATTERS?

THE new accounting system applied to the Equipment Department is now making possible accurate reports. The details of the experience of thirty months should be sufficient to draw conclusions regarding equipment matters.

When the equipment system was installed, it was the intention that the divisions should make their own equipment pay roll reports. It has never been contemplated to establish a system of espionage. The rentals were trial rates, and represented an average of the cost of operating the particular kind of equipment, taking into account the light use as well as the hard service. The department expects to lose money on the hard service, but to gain on the light service.

From the reports, it appears that some maintenance foremen (and it must be with the knowledge and consent of some supervisory engineers in the divisions) are "short changing" the Equipment Department in reporting on the us of equipment. This is borne out by the financial reports, which show too much difference in the use and earnings between divisions which are otherwise comparable.

(Continued on page 12.)

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EVERY employee of the highway commission has a direct interest in the improvement of the highway organization's methods and results, both engineering and clerical, office and field. To that end, the State Highway Engineer invites constructive criticism or suggestions from every employee.

Ideas as to the more economical and efficient handling of your job, or suggestions for elimination of waste will be welcomed. Criticism is also desired from persons outside the organization, who are in a position to give facts.

Send only signed communications addressed as follows: California Highways, P. O. Box 1103, Sacramento, Cal.

OCTOBER 1926

California Highways

VOL. 3 No. 10

Safety is Built Into Monumental Southern Project

DIVISION VII has just completed a project on the Coast highway in San Diego County (VII-S.D. 2-B, C, and D) which will stand for years as a monument to its builders, both engineers and contractors. Into the reconstruction of 14.93 miles of pavement between a point 2.5 miles south of San Onofre and Oceanside has been builded standards of alignment and grade and quality of pavement which exemplify, to a marked degree, the high character of work now being done by the California Highway Commission.

The safety of the highway has been effectively improved by numerous minor line and grade changes, and by two major line changes which involved the construction of subways under the tracks of the Santa Fe Railroad. Tangents and long radius curves have taken the place of blind curves and kinks, the cause of frequent serious accidents, while a grade crossing that has taken its toll of lives has been eliminated altogether. A new second-story cement concrete pavement, twenty feet wide, has taken the place of the old fifteen-foot slab.

The contract for this improvement was awarded by the commission on July 13, 1925, to Jahn and Bressi of Los Angeles and accepted as completed on September 14th of this year. It represents an expenditure of approximately $550,000 of reconstruction funds and completes, with the exception of a few miles, a twenty-foot pavement from Los Angeles to the San Diego city limits.

Ransom Discusses Problems.

Many interesting problems were met and solved during the course of the work. How traffic was handled, how the grading of sand effected the strength of concrete, and other matters are discussed by Assistant Division Engineer L. M. Ransom of Division VII, as follows:

The original contract covered the reconstruction of 13.1 miles but later an addition of 1.83 miles was made at the southerly end, continuing the work to Eighth street in the city of Oceanside, a total of 14.93 miles.

This extension included the most important line change on the entire project and involved, in addition to grading and paving, the elimination of a dangerous grade crossing over the Santa Fe Railroad, the scene of many serious and some fatal accidents. (See front cover and map showing line change.)

The crossing was eliminated by building a subway which has removed danger to traffic and greatly improved the alignment. The new pavement approaches the under pass on curves of 1000-foot radius and the San Luis Rey River bridge on a tangent. This is in marked contrast to the original alignment which had two right-angle turns approaching the railroad crossing and a curve of 71-foot radius at the north end of the bridge.

New alignment to eliminate bad curvature also was adopted at the approach to the Las Flores subway (see map). This required the construction of a new subway and the abandonment of the one formerly in use, but the alignment secured has a 900-foot radius curve compared with a curve of 100-foot radius through the old under pass. The latter was the scene of numerous accidents due to blind and sharp curve conditions.

The Santa Fe Railway Company participated in the cost of the subway north of Oceanside as well as the new one at Las Flores.

On the entire project except on the line changes, the old 15-foot pavement was used as base for the new slab, which was placed twenty feet wide with a minimum thickness of five inches at the center, seven inches at the edges of the old pavement, and nine inches at the outside. The construction throughout was in accordance with the latest standards of the commission.

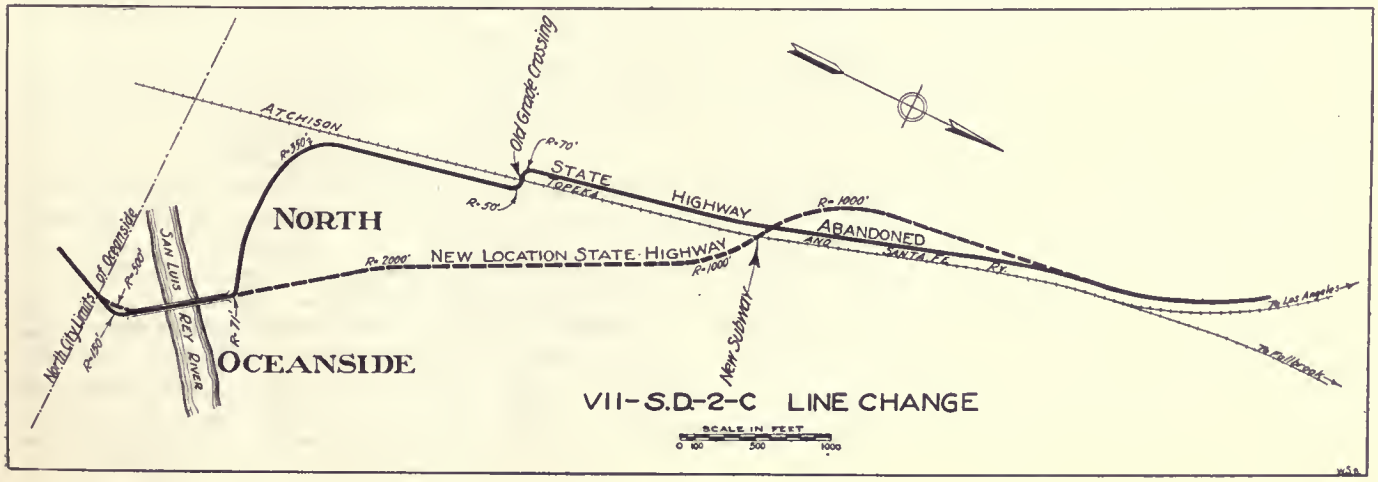
Importance of Sand Demonstrated.

In this connection it is interesting to note the effect on the concrete of the grading of the sand, as shown by laboratory tests of sand samples. At the beginning of the work the sand was so fine it barely passed the specifications. As the work progressed, the sand became too fine to be acceptable and a coarser grade from another source was obtained for the remainder of the work.

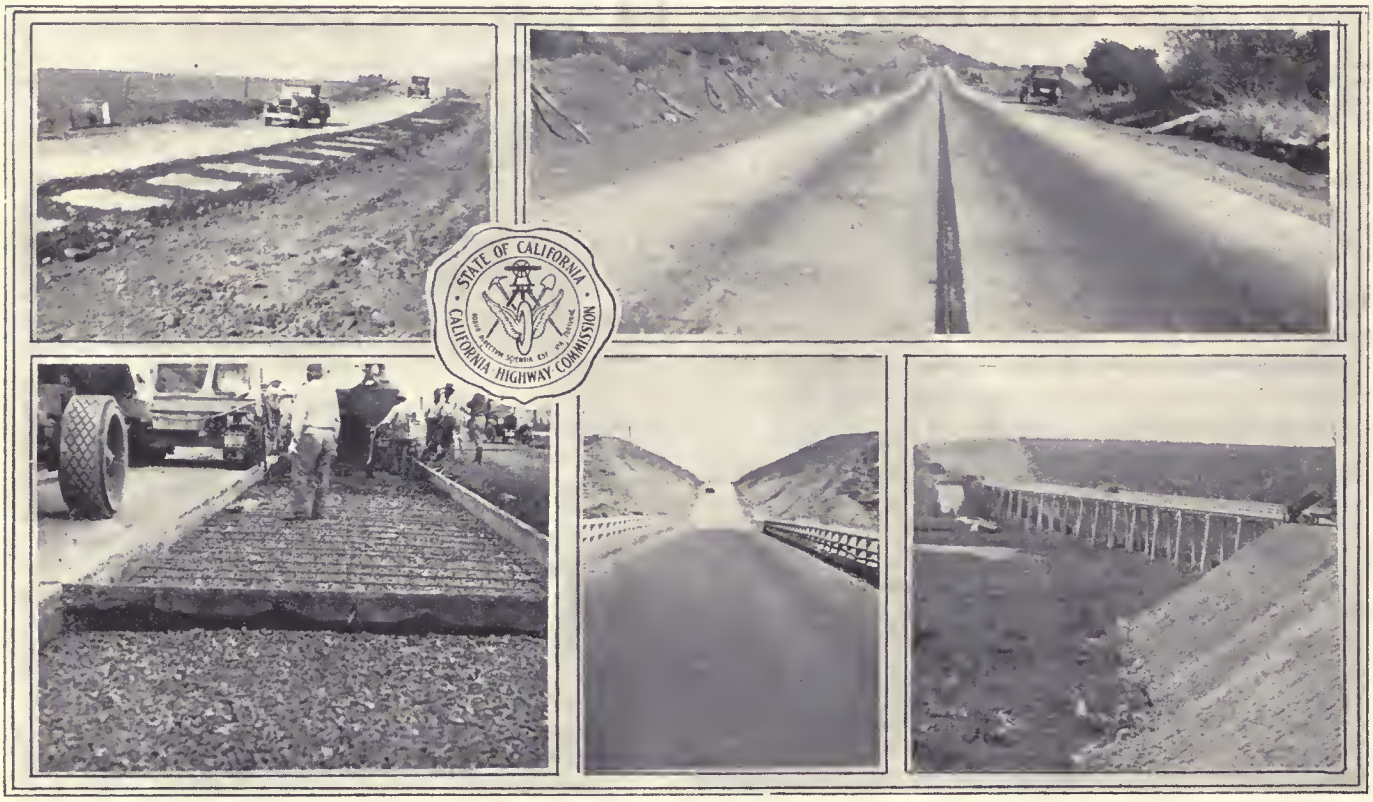
The average strength of concrete as shown by 28-day breaks of cylinders covering forty-five samples, using the fine sand, was 3293 pounds per square inch. The average strength of 103 samples containing the coarser sand was 5078 pounds per square inch. The average break for the entire contract was 4535 pounds per square inch.

The following sieve tests of the coarse and fine sand, with corresponding cylinder breaks, are of considerable interest.

(Continued on page 4.)



WHERE DANGERS WERE REMOVED FROM THE HIGHWAY



RECONSTRUCTION ON COAST HIGHWAY—Views on new section of Coast route in San Diego County recently rebuilt under direction of Division VII. *Upper left,* handling two-way traffic on improved shoulder while ten-foot strip of concrete cures; *Upper right,* completed section of new pavement, 20 feet wide; *Lower left,* rock subbase and reinforcing steel, where highway is on new alignment to eliminate curves; *Lower center,* looking north from San Luis Rey bridge, deep cut made to eliminate right angle turn into this structure; *Lower right,* earth used to make fill at south end of bridge to widen curve.

Daily report of January 8, 1926, shows following sieve test on sand:

Screen and sieves	*Fine aggregate* 2	*Spec. Lim.*
No. 3 (.263)	99	90-100
No. 4 (.185)		
10	76	55- 80
20	52	30- 55
30	29	15- 35
40	19	10- 15
80	4	0- 10
200	1	0- 3

with a resulting 28-day break on test cylinders No. 28-B at 3680 pounds.

Daily report of August 6, 1926, shows following test on sand:

Screen and sieves	*Fine aggregate* 2	*Spec. Lim.*
No. 3 (.263)	98	90-100
No. 4 (.185)		
10	68	55- 80
20	44	30- 55
30	25	15- 35
40	16	10- 25
80	4	1- 10
200	1	1- 3

with a resulting 28-day break on test cylinders No. 146-B at 6650 pounds.

Construction Details.

On the half width construction, it was necessary to set the header boards on the center line of the old pavement. This presented a rather difficult problem which was solved by drilling holes through the old pavement. To wooden stakes driven into these holes were nailed the 5-inch wooden header boards. A portable Ingersoll-Rand air compressor and a jackhammer were used for drilling holes 2½ to 3 inches in diameter and spaced 1½ feet from the ends of the header boards and not more than 4 feet apart on the intermediate stakes. The cost was $350 per miles, or about 6¾ cents per foot of headers. Stakes used were 2 inches by 2 inches, by 12 inches long.

The difficulty usually experienced in holding reinforcing steel in its proper position was another obstacle overcome on the latter part of this work. Resident Engineer W. D. Eaton and Assistant Resident Engineer W. T. Lamb perfected a supporting device which will be described in detail in a later issue of the Bulletin.

At several points on the job the subgrade was unsatisfactory. At these places a subbase of 8 to 10 inches of crushed rock was placed prior to placing of pavement. In addition to this rock cushion, a 6-inch clay tile drain was installed parallel to the highway with satisfactory results. The pavement also was heavily reinforced on these sections.

Two-foot shoulders of Corona quarry waste, 5 inches thick, were placed on either side of the pavement for the entire length of the contract. These shoulders were watered and rolled with a 12-ton, 3-wheel roller.

The vialog tests taken over completed pavement are indicative of the quality of the work. A reading of 7.4 units of roughness per mile, an excellent record, was recorded.

How Traffic Was Handled.

Handling of the heavy traffic over this route while construction was under way was another important feature of the project. Travel is heavy as indicated by a census taken on July 18th and 19th, 1926, near the south limits of Oceanside, which showed a count of 5842 and 3375 cars, respectively, per day.

To adequately handle this traffic entailed considerable additional expense for placing the pavement in ten-foot widths for the entire project. The difficulty of obtaining suitable bypass locations and danger of a traffic tieup on detours during the rainy season made such procedure imperative. By providing an additional width of

(Continued on page 6.)

Aims of the Maintenance Department

By T. H. Dennis, Acting Maintenance Engineer.

THE Maintenance Department has assigned to it the operation of 6590 miles of State highway, except sections now under contract or constructed by the Forest Service and still under maintenance by the Federal government, in daily use by 1,500,000 motor vehicles carrying some 3,000,000 passengers. The annual cost is approximately $4,000,000, which expenditure, roughly, is divided into 50 per cent labor, 29 per cent equipment rentals, and 21 per cent materials and labor. In this task 1700 men are employed.

Direct field supervision of maintenance activities over the extensive territory of California, larger in area than some nations of Europe, is vested in the division engineers and their assistants, assigned to maintenance.

The aim of the maintenance forces in the performance of their duties should be:

First, high standard maintenance at a minimum of cost; and

Second, the cultivation of public appreciation and interest in the work of the department.

The attainment of these aims entails a definite purpose and organized effort, which purposes should be understood thoroughly by every individual within the organization.

High maintenance standards are synonymous with a maximum measure of safety and low vehicle operating costs, both popular with the public.

The cost of such maintenance is directly affected by the coordination of construction with maintenance and the effective combination of labor, equipment and materials. Failure in either will result in high costs. Construction projects involving additional maintenance to insure their readiness for use are not coordinated.

Occasional high pressure inspection by the directing heads, which neglects a detailed study of methods and results, is of no benefit and weakens the morale of the organization. Frequent, unhurried trips should be made in company with the foremen over their respective sections for a discussion on the ground of their many problems. On such occasions attention should be called to details of the work not receiving proper attention. Such trips also will give opportunity for discussion of the trend of traffic and the possibility of development affecting the highway.

Foremen should be impressed with the fact that minor improvements, where practical, should be of standard construction, to the end that they may be included in the road's ultimate cross-section.

Close study also should be made of the section's local material resources, for it frequently happens that combinations of available material prove more serviceable than their use separately.

Initiative Should Be Encouraged.

Since improvements in methods and devices are usually the outgrowth of practice, encouraging direction along lines of personal initiative should be given the foremen.

As the highways become more urban in aspect, the handling of permits is another duty of the Maintenance Department which assumes considerable magnitude. To prevent interference with future construction and to offer a common basis for handling, there is under way the establishment of theoretical curb lines within which no encroachment under permit will be granted.

No public service effort affords the same opportunity for judgment or public contact as does the maintenance work.

Construction, unless local, is not easily visualized by the motorist; distant projects, although of great moment, fail to compare in importance with the maintenance performed on roads daily affecting his social and economic activities. The occupant of each passing vehicle feels an investor's interest in this work and demands as of right, not only consideration of his safety and convenience, but efficiency and economy in methods and costs. That he so observes and criticises is evinced by numerous letters received at headquarters, not all commendatory in tone.

Inasmuch as our work is an undertaking by and for the people, foremen should, by their work and attitude, deserve and maintain public commendation. Wilful or thoughtless disregard of public safety or property by a foreman indicates failure to fully appreciate his part in the desired contact between the commission and the public.

It is the purpose of the Headquarters Maintenance Department, through its traveling representatives, to pass on all maintenance and specific improvements. Attention will be called to any deficiencies, either in methods or results, and instruction given for their improvement.

It will always be the endeavor of headquarters, where practical and possible and as funds permit, to aid in the building up of the local maintenance sections, to the end that the aims here briefly outlined may be realized.

T. H. DENNIS, ACTING MAINTENANCE ENGINEER, HAS RECORD OF STEADY PROMOTIONS.

T. H. DENNIS, who on August 1st was appointed by State Highway Engineer R. M. Morton to the position of acting maintenance engineer, has a record of steady promotions since he first entered the department as an instrumentman on April 1, 1912. His years of service in Divisions V and III, during which he worked his way upward to the position of principal assistant engineer, well fit him for the position he now holds.

T. H. Dennis.

Dennis was advanced from instrumentman to chief of party, then resident engineer, assistant engineer, and principal assistant engineer. Each promotion was the result of a civil service examination, which advanced Dennis from the lower grades to a Grade V engineer, his present rating. He always studied the job ahead, and when a vacancy occurred he was ready for it; he is a product of the department. His last position as principal assistant engineer to F. W. Haselwood placed him in charge of the maintenance in Division III, where his work attracted a favorable attention.

Dennis has entered upon his new duties with characteristic vigor and is now engaged in a survey of the many and varied problems of climate and soil and weather conditions affecting maintenance on the far-flung highway system of California. He will never be satisfied until he familiarizes himself with every detail of the work in each division and until he knows every foreman by his first name.

Dennis was born in Wisconsin and is a graduate of the State University of that state. His aims and ambitions for the Maintenance Department are set forth in the accompanying article.

NIGHT TRAFFIC COUNTS

NIGHT traffic on the state highway, particularly in the San Joaquin Valley, appears to be growing. This conclusion is indicated by counts made during the summer by the maintenance forces of Division VI.

Traffic counts generally have been taken for 16-hour periods from 6 a.m. to 10 p.m. Studies made in California in 1922 by the Bureau of Public Roads indicated that traffic during these hours was 92 per cent of the total for the 24 hours.

Observing that motorists are using the highways more and more for night driving, Division VI during last July made counts at five stations in the San Joaquin Valley to determine the percentage of traffic using the highways for the eight hours from 10 p.m. to 6 a.m. as compared with the total for the 24 hours.

It was found that the night traffic, that is, the count from 10 p.m. until 6 a.m. totaled 16 per cent of the whole or double what it was in 1922. In view of the fact that this count was taken during the warmer weather in the San Joaquin Valley, it may be that the same percentage would not hold for all sections of the state. Nevertheless it is evident to observers that night driving, especially the movement of trucks, is on the increase.

Those Stenographers.

Headquarters Shop, R. H. Stalnaker, dictating a letter to a division engineer: "Your P and H shovel, etc." Stenographer transcribed as follows: "European and H shovel."

Heading on an invoice received from Shop II: "Headquarters Office—Bride Department."

"A WORD OF APPRECIATION"

A LOS ANGELES man, whose business takes him over many miles of the state highway system, writes State Highway Engineer R. M. Morton to express "a word of appreciation" of the work now under way. He evidences particular interest in the high standards of the reconstruction work and the Commission's policy of serving traffic by maintaining good travelable detours.

His letter follows:

THE KAUFMAN COMPANY
Los Angeles

October 5, 1926.

Mr. R. M. Morton, Highway Engineer,
Sacramento, California.

Dear Mr. Morton:

Having been connected with the Highway Commission for a number of years, I am well aware of the large number of kicks and complaints registered against the Commission and its engineers, and I feel that a word of appreciation of good work well done will not be amiss.

I am continually traveling the state highways from one end to the other, and the vast improvements being made with regard to line changes, widening of curves, and elimination of railroad grade crossings make traveling a delight. This is especially noted on the Coast road to San Diego south of Los Angeles and on the Ridge road.

Another thing that a traveling public should appreciate is the well-maintained detours and the sign "Detour ahead" no longer is a veiled threat.

Very truly yours,

(Signed) A. V. SWARTZ.

SAFETY FEATURES BIG RECONSTRUCTION PROJECT

(Continued from page 4.)

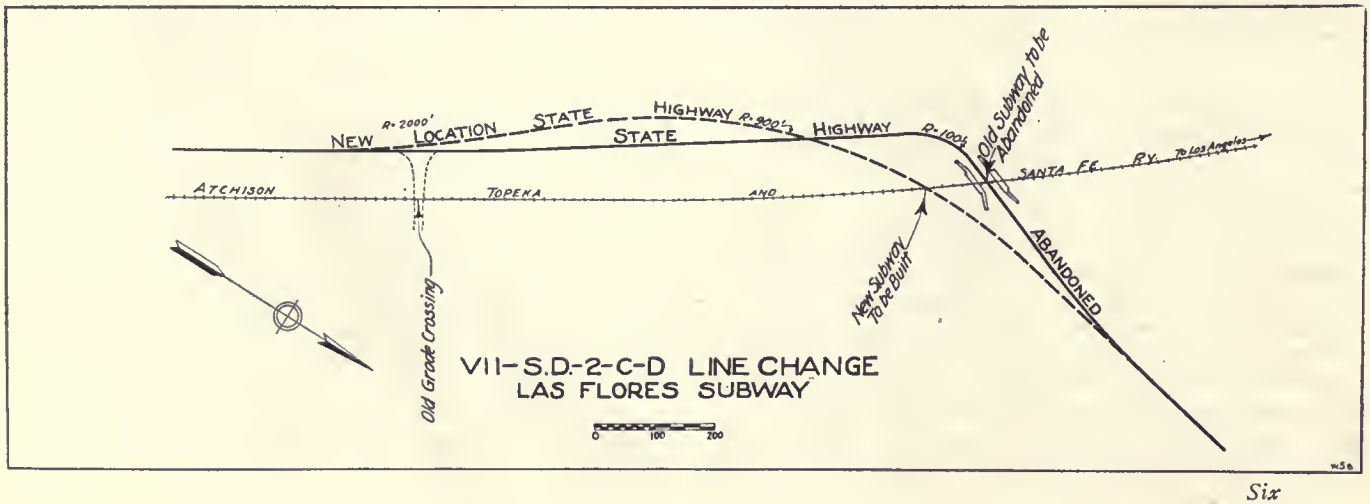
shoulder, it was possible to handle a double line of traffic on half of the old or new pavement and the adjoining shoulder, a minimum width of fifteen feet between edge of old pavement and toe of cut bank being maintained. During the wet weather, when the shoulder became too soft for travel, a control was established for one-way traffic on the half-width pavement.

Besides the additional grading required for the extra width of shoulder, it required approximately $55,000 to provide the additional cost of pavement laid one-half width at a time, to build and maintain the bypass on the widened shoulder, and to provide the traffic control.

By reason of these precautions the unusually heavy rains of last winter caused little inconvenience to the heavy traffic over the highway; in fact, the commission was commended for the satisfactory manner in which traffic was handled.

Practically all of this project with exception of a small portion near Oceanside is within the famous Rancho Santa Margarita. This property was owned by the late Jerome O'Neill, who granted the state, without cost, rights of way for line changes and bypass privileges. Some additional right of way was required between the O'Neill ranch and Oceanside, which was secured without the necessity of condemnation proceedings.

The commission was represented on this contract by Resident Engineer W. D. Eaton and Assistant Resident Engineers W. T. Lamb, W. J. Nelson, O. W. Monroe, F. R. Belknap and H. B. Lindley. Credit is due to the resident engineer and his assistants and Jahn and Bressi, the contractors, for the efficient handling of the actual construction as well as of the difficult traffic problem involved. The accomplishment is one of which they may well be proud.



Tests of Binder Materials for Gravel and Crushed Rock Surfacing

C. L. McKesson, Materials and Research Engineer.

THE testing and research laboratory has been endeavoring for a considerable period to develop tests which will determine the relative efficiency and suitability of binder materials. The following description, which may be considered a progress report covering present practice, it is hoped, will be of particular value to field engineers in interpreting test reports issued from the laboratory.

Tests for cementing value of surfacing materials, as developed in the laboratory, already have been described in the April, 1926, issue of the Bulletin.

Proper selection of binders or fillers for the considerable mileage of gravel and crushed rock surfacing heretofore constructed, in locations where proper fillers or binders were difficult to obtain, has been the subject of considerable investigation.

On new construction rock and gravel intended for surfacing is sometimes found to be lacking in cementing properties, but otherwise to be suitable for use. To remedy the deficiency in binding or cementing properties, it has become the practice to add binding material by mixing it with the surfacing during construction or later by blading and mixing on the road.

Suitable binder material usually consists of disintegrated or weathered rock or clay and sand mixtures. The term "clay binder" is quite commonly applied to such material, but is not always an accurate description. So-called "sticky clay binders" have been tested which contained less than 25 per cent of clay and more than 75 per cent of sand and silt and which, therefore, fall entirely outside the class of soils known as "clays."

Fine Material Essential.

In general in making cementing tests of surfacing materials, it has been found that the road metal must contain at least 15 per cent of material passing a 100 mesh and 8 to 10 per cent of dust (removed in the washing test). These percentages are in terms of the portion of surfacing passing one-half inch circular opening screen. Except with very soft rock which grinds up rapidly under traffic, a less percentage of fines will usually result in a loose dusty surfacing. Some road metal does not show satisfactory cementing value even with larger percentages of fines, due to the inert nature of the material, but even with high cementing properties in the material *fines are essential in about the minimum quantities* stated.

Cementing tests on surfacing metals are made on the portions passing one-half inch screen with a minimum dust content as indicated above.

How Tests Are Made.

The sample is moistened and mixed as in the preparation of a concrete sample. The amount of water used varies with the character of the material, but an effort is made to approach the condition known in soil tests as moisture equivalent saturation. The same consistency in concrete would be defined as "stiff." With ordinary crushed rock surfacing material, the amount of water usually runs from 10 to 12 per cent. The material, after wetting, is tamped into a 4½-inch cubical mould and is placed in a warm oven at a temperature of about 100° F. until it has dried sufficiently to permit its removal from the mould. Drying is then continued until the specimen ceases to give off moisture, after which it is capped with plaster of paris and tested for compression in a Universal testing machine.

The cementing value is taken as the average compressive strength per square inch of three specimens. There is a wide variation in results obtained with different materials, but fairly uniform results can be obtained in repeated tests of the same material. The strength developed ranges from zero to about 225 pounds per square inch. One hundred to 150-pound strengths are not unusual.

Binder materials are tested in a similar manner except that clean concrete sand all passing a one-half-inch screen is used as a basis, the binder material being added in an amount sufficient to bring the fines up to 15 per cent passing 100 mesh and about 10 per cent of wash. The clean concrete sand has no cementing value and the strength of specimens containing the mixture of binder and sand is, therefore, due to the presence of the binder and represents the cementing value of the binder material.

In addition to cementation tests, binder materials are tested as soils for moisture carrying characteristics and for lineal shrinkage.

Practice in Binder Tests.

A recent study of the suitability of a so-called "clay" binder will serve as an example with which to illustrate our practice in binder tests.

The "clay" binder tested as a soil was found to contain 21 per cent of clay, 26 per cent of silt, and 53 per cent of sand. The moisture equivalent was found to be only 13 per cent, indicating it to be a soil which will not retain an excessive moisture content in wet weather. Lineal shrinkage was found to be only 3 per cent, showing it to be a stable soil not greatly affected in volume by alternate wetting and drying.

In the cementing test, with clean concrete sand, using 26 per cent of binder and 74 per cent sand, a compressive strength of 128 pounds was obtained. This was considered a satisfactory cementing value.

This binder material was used to cement a crushed gravel surfacing of granitic material which, with its own stone dust, had only 50 to 60 pounds of cementing value. This low cementing value rendered the material unsuitable for use.

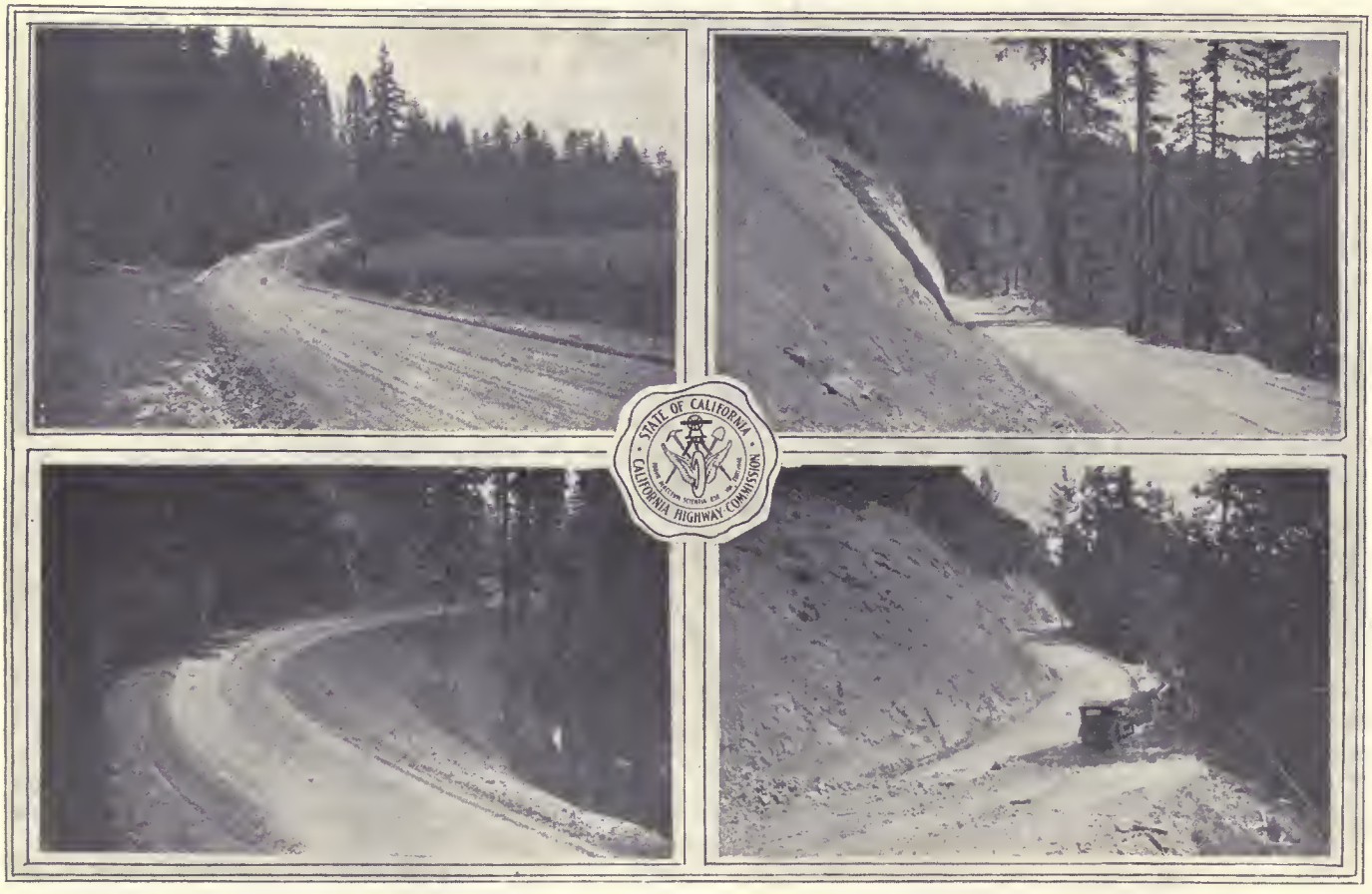
This surfacing material was mixed with the binder described above in the proportion of 85 per cent of surfacing rock including stone dust and 15 per cent of the binder. The cementing value on the mixture was 155 pounds per square inch and indicated that the addition of 15 per cent of binder was sufficient to insure satisfactory results. Subsequent tests on field samples of binder and crushed material as mixed and delivered to the work showed cementing values of 125 to 150 pounds.

Motor vehicle traffic has made the quest for a suitable and efficient binder for rock-surfaced highways one of the important tasks confronting highway engineers. Whatever the laboratory can contribute to that end it will gladly do.

THE WORKING BASIS.

The inevitable result of the National Highway program is to focus highway work and highway expenditures in the state highway departments. Even the federal money is spent under the direction of the state engineers, and each state has a contract with the federal government as to how the money shall be spent and how the work is to be done. If the power of a state can be used in such a fine spirit of cooperation, and if the government of the United States itself is willing to share its authority with the states on a mutual working basis, surely county and township authorities have nothing to lose by meeting their own state authorities half way, and the people who use the roads and pay for them have everything to gain.—*The Nation's Highways.*

RECONSTRUCTION PROJECT COMPLETED ON REDWOOD HIGHWAY



NEW SECTION OF REDWOOD HIGHWAY—Curves and other dangerous features of the original road have been eliminated by regrading six miles of the Redwood highway between Leggett Valley and two miles north of Rock Creek, Mendocino County. Above are views of the new work.

SIX MORE miles of the Redwood highway have been materially improved by the completion of the contract of the Butterfield-Sears Company for reconstruction, grading, and rock surfacing that portion in Mendocino County between Legget Valley and two miles north of Rock Creek.

The old road, a decidedly crooked dirt road 14 to 18 feet in width, was originally constructed in 1917 by convict labor. It was the best road possible with the money available at that time and was located on the steep mountain slopes 100 to 200 feet above Eel River.

In general, the new highway conforms to present high standards of construction. It has a minimum 200 foot radius open, and 300 foot radius blind curves, and, except for a short stretch of 1000 feet, has a 6 per cent or less compensated grade.

Many Curves Eliminated.

The new work has eliminated many 50 foot radius curves, blind turns, sharp reverse curves and stretches of 7 per cent uncompensated grade. Due to the lessening of curves, the road has been shortened four-tenths of a mile in 6.4 miles. Crushed rock surfacing 20 feet wide has been placed throughout the length of the new section.

The Contractors encountered many difficulties before completing the project, which extended over two working seasons; only the rough grading was finished during the first summer.

Slides Hamper Progress.

Last winter many slides of large magnitude occurred, making it practically impossible to maintain an open road during the month of February. One of these unprecedented slides necessitated the use of a drag line and a high pressure pump to sluice the sliding material down the mountain into Eel river. For 300 feet above the road, the mountainside, including massive trees with trunks two to five feet in diameter, slid into the newly graded road and it was necessary to expend approximately $20,000 to remove slides in the vicinity of the project.

The completed work will cost approximately $237,500, or nearly $38,000 per mile. The total excavation, exclusive of slides classed as extra work, was 335,000 cubic yards, or 53,000 cubic yards per mile.

The Butterfield-Sears Company, the contractors, are to be complimented for the cooperation shown Resident Engineer M. H. Hubbs and Division Engineer T. A. Bedford. The company forced the work to completion within the time limit in the face of many difficulties.

A SOUTHERN VIEW.

Highways are owned by the public. The highway rolling stock, on the other hand, and everything concerned with it, is privately owned. These two conditions make highway financing much more complicated than railroad financing. But it is significant that the tendency is to insist on the users of the highway paying a larger share of the cost.—*Arkansas Highways.*

"Make no little plans; they have not magic to stir men's blood and probably themselves will not be realized. Make big plans; aim high in hope and work, remembering that a noble, logical diagram once recorded will never die, but long after we are gone will be a living thing, asserting itself with ever-growing insistency. Remember that our sons and grandsons are going to do things that would stagger us. Let your watchword be order and your beacon beauty."

DIVISION II FORCES BUILD BRIDGE IN RECORD TIME

THE highway department is such a far-flung organization that many splendid accomplishments often go unnoticed. It was only a short while ago that accounts reached headquarters of the remarkable achievement of a maintenance crew of Division II, to which was assigned the task of opening the Klamath River highway to traffic following the destruction by fire of the suspension bridge at Orleans.

On June 13th last, a fire of unknown origin damaged this structure to such an extent that the cables on one side broke, wrecking all of the central span not already destroyed by the fire. The topography of the country and the depth of the river were such that a detour to other bridges or fords was impossible and an emergency crossing was imperative to serve traffic, it is explained by Division Maintenance Engineer S. W. Lowden.

Temporary Bridge Decided Upon.

It was decided that the quickest way to meet the emergency was to erect a temporary summer bridge. The job was assigned to a maintenance crew headed by Foreman Guy McMurtry, who has charge of about 100 miles of highway on this route.

Suitable lumber could not be secured in the vicinity on short notice, but a small sawmill operated by a Fordson engine was located nearby and this was leased by the division for the production of necessary material. The crew began logging in the woods on June 15th, two days following the fire; the first lumber was ready for use on June 16th, and on June 28th, just thirteen days after the work started, traffic was resumed. A bridge, 470 feet long, had been built through flowing water seven feet in depth at a cost of $2,044.67 or $4.35 per lineal foot. This cost includes approaches and all incidental work and considering that two weeks before completion of the bridge the timber was growing in the woods and the crew was scattered along a hundred miles of highway, the cost is exceptionally low.

Ingenious Device Speeds Work.

An important factor which contributed to the speed with which the work was done was an ingenious traveler devised for placing bents and other heavy timbers. It is described by Engineer Lowden as follows:

> This traveler consisted of two poles, each 40 feet long. On the front end was erected a 10-foot gallows frame from which the timbers were swung by means of blocks. The traveler timbers were kept well greased and moved over the partially completed structure by means of a pair of double blocks. The traveler was approximately two and one-half times as long as the distance between bents, which made it possible to move it ahead sufficiently to have the gallows frame directly over the bent to be placed. The timbers were then placed and the operation repeated.

BRIDGE THAT McMURTRY BUILT—*Above,* burned bridge across Klamath River at Orleans; *Below,* temporary structure, 470 feet long, erected by maintenance forces in thirteen days, including time necessary for felling trees and sawing timbers.

The suspension bridge is now being replaced as the low level temporary crossing will not serve during periods of high water.

"MEN WHO REFLECT CREDIT"

COOPERATION with the counties has been one of the watchwords of the present State Highway Engineer and Commission. Local officials always have been free to seek assistance whenever in need of help.

Recently, Colusa County sought the aid of the Maintenance Department and a man from Division X was assigned at the expense of the county to supervise pavement patching. The following letter from a member of the board of supervisors tells of the incident:

Maxwell, California,
September 26, 1926.

Mr. R. E. Pierce,
Division Engineer,
Sacramento, Calif.

Dear Sir:

Mr. M. D. Cuthbert, whom you loaned us from the Stockton Division for macadam patch work proved most satisfactory; and it is such men who *reflect credit on any organization.* I thank you very much for this favor; and kindly express my appreciation to Mr. Dennis for his interest in the matter.

When I can be of assistance to you kindly command me.

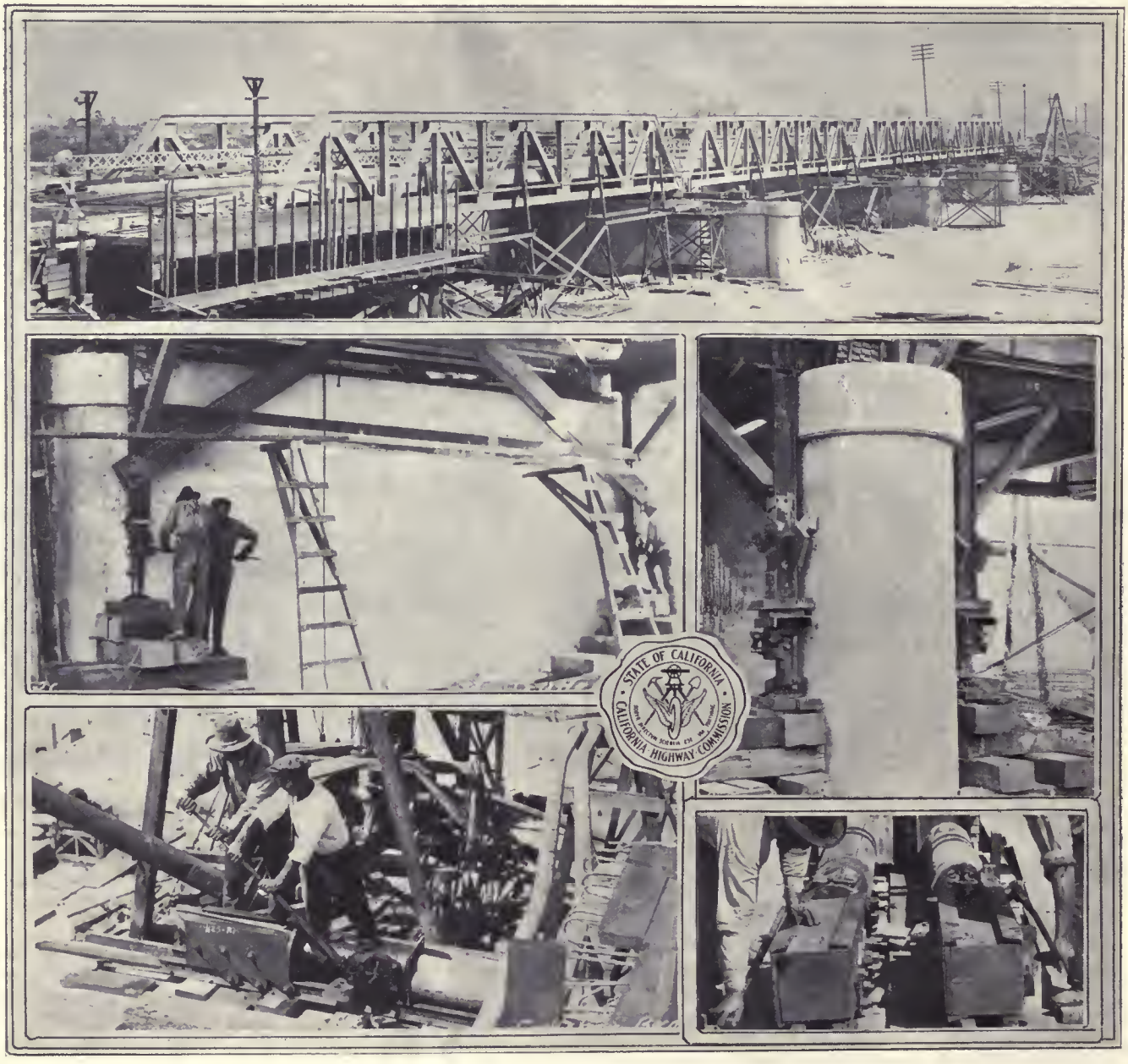
Very truly yours,

(Signed) LOUIS G. SUTTON,
Supervisor Fourth District, Colusa County.

THE MAN WHO COUNTS.

IT IS not the critic who counts; not the man who points out how the strong man stumbled, or where the doer of deeds could have done them better. The credit belongs to the man who is actually in the arena; whose face is marred by dust and sweat and blood; who strives valiantly; who errs and comes short again and again, because there is no effort without error and shortcoming; who does actually strive to do the deeds; who knows the great enthusiasms, the great devotions, spends himself in a worthy cause; who at the best knows in the end the triumph of high achievement; and who at the worst, if he fails, at least fails while daring greatly, so that his place shall never be with those cold and timid souls who know neither victory nor defeat.—*Theodore Roosevelt.*

TRAFFIC CONTINUES WHILE BRIDGE IS MOVED TO NEW POSITION



BRIDGE MOVES—Widening of Rio Honda bridge, Los Angeles County, necessitated by moving the existing structure to make room for an additional span of the same width. Views show how this was done by use of hydraulic jacks. Traffic continued uninterrupted while the bridge was raised slightly and moved over to its new position.

TO OBVIATE a detour of several miles for a heavy volume of traffic, the Bridge Department, cooperating with the contractors, worked out a plan which was successfully executed for the moving of the Rio Honda bridge on Whittier boulevard, Los Angeles County, up stream a distance of fifteen feet without interfering with travel. It is estimated 75,000 vehicles passed over the structure while the work was under way, unaware that the 400-foot steel bridge was moving or that they were being saved $25,000 in operating expense because of the elimination of the detour.

For successfully moving the structure which weighs well over 1000 tons without stopping traffic, the state will pay Gutleben Brothers, the contractors, $2,500.

The present structure is twenty-four feet wide, but with the widening of Whittier boulevard it has become too narrow to safely handle the heavy traffic now using this trunk highway. To preserve good alignment, it was decided to move the existing bridge up stream fifteen feet and to erect alongside a second bridge of the same length and width. This will provide a twenty-four foot roadway for traffic going in each direction.

Because the present bridge is in first class condition, the erection of a second similar structure was deemed the most economical solution of the problem.

Plan For Moving Explained.

The moving of the four steel spans, each 100 feet long, was carried on simultaneously, it is explained by C. W. Jones in charge of the Bridge Department office in Los Angeles. With 75-ton hydraulic jacks placed under each support, the bridge was first raised eight inches to permit greased rails to be placed

DIVISION VII REPORTS EXPERIENCE IN PLACING RIPRAP

UNPRECEDENTED high tides and storms at sea during the early months of the present year caused unusual damage along the Coast highway north of Santa Monica, Division VII. Work of placing heavy riprap rock along exposed sections of the highway had been under way for two years and its effectiveness in protecting the highway embankment along the beach was demonstrated during the storms. Where the work had been finished there was no damage to the highway.

Quick work of maintenance crews was all that prevented even more serious damage. After the storm subsided, work of placing the heavy rock protection was resumed and has now been completed after five months' work.

Scott Outlines Methods.

Methods followed and costs on various types of equipment are outlined by E. T. Scott, superintendent of maintenance for the division, as follows:

A gas shovel and dump trucks were used to replace the highway embankment carried away by waves. As fast as the embankment was replaced, it was protected by placing blocks of riprap rock weight from 300 to 1500 pounds at the rate of from 2.5 to 4 tons per lineal foot.

The rock was shipped to Santa Monica Canyon on flat cars and was hauled on state owned trucks and placed at the foot of the highway embankment. Due to lack of space at the siding it was necessary to have any hoisting machinery used to unload the cars, built on the trucks.

Four 5-ton trucks with flat racks, each equipped with a hoist for loading, unloading, and placing the rock were used. Two of the trucks each carried a stiff leg boom provided with chain block and stone hooks. On one truck a hydraulic hoist was used to operate the stiff leg boom and gave much better results than where chain blocks were used. The fourth truck was equipped with a drum hoist and this gave the best results.

Shops Construct Hoist.

All hoisting equipment was constructed and installed on the trucks at the division shops at Lankershim. While no mechanical difficulty or breakdowns were experienced with any of the hoists, there was a marked difference in their performance.

In the case of the truck equipped with drum hoist, the cost of handling the rock was 18 cents per ton for unloading the flat cars; 11 cents per ton for unloading the truck and partial placing, and 6 cents per ton to complete placing the cost of hauling figured from the time the trucks were loaded until the unloading started, was approximately the same for all trucks and averaged 9½ cents per ton mile.

For the truck equipped with hydraulic hoist, the cost of loading, unloading, and placing was 59 cents per ton; and for trucks equipped with chain blocks, it cost $1,12 per ton. The cost of the rock f. o. b. Santa Monica Canyon was $2.65 per ton.

---

beneath the shoes, which had been firmly bolted together. The bridge was then lowered onto the shoes between which struts had been placed to better distribute the load. The jacks were made to bear against each shoe on the down stream side, the thrust being obtained by strapping kick blocks to the rails. A crew of twelve men operated the jacks. A load of forty tons was required at the start and about twenty tons after the bridge began to move.

The foundation of the original bridge consists of concrete cylinders resting upon pile foundations, connected by thin diaphragms. Since the end reactions of the four trusses of the widened structure will come on this weak diaphragm, it was necessary that it be strengthened. Concrete beams twenty-two feet long, fourteen feet high, and twenty-one inches wide were built on each side of the diaphragms. Each of these beams will have a central dead load of 133 tons when the additional spans are completed. The bridge is being built of steel with a floor of concrete.

A. S. Kennedy is resident engineer on this project. He is being assisted by H. R. Lendecke.

Give the Maintenance Man Right-of-Way.

Travelers should give highway workers the right of way whether it is to the right or the left. It makes bad work where the scraper or plow crosses the road. Often the maintainer or patrolman has two or more horses on the wide machine. Whether driving a motor vehicle or a team it is easier and quicker to give the road than to try to hold it. A little matter of courtesy and accommodation on the road, coupled with common sense, will save a lot of trouble sometimes, and also avoid endangering lives. Keep in mind that the highway employes are working for you—are in your pay.—*Arizona Highways.*

PLACING RIPRAP, DIVISION VII—Trucks equipped with derricks and grappling hooks are in use by maintenance forces of Division VII for placing protection along the coast highway north of Santa Monica. Lower center view shows damage wrought by wave action during storms.

FAITHFULNESS OF MAINTENANCE FOREMEN APPRECIATED

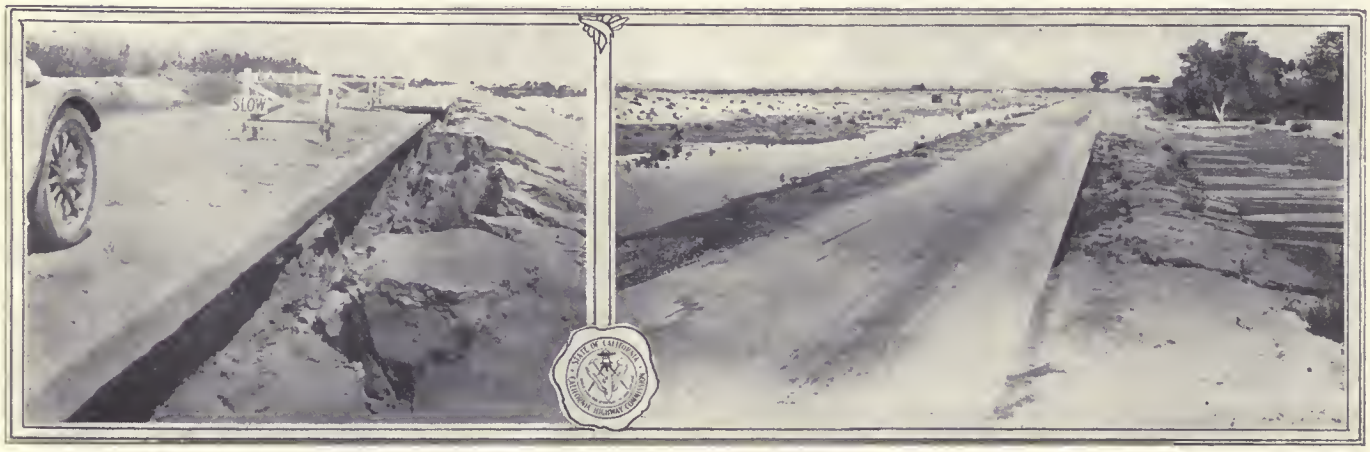
IN THE last issue of the Bulletin a letter from a highway user of Imperial County was published, complimenting Maintenance Foreman F. C. Davis of Westmoreland upon his efforts to serve traffic following a cloudburst in the vicinity of the Salton Sea which caused serious damage to the state highway. What was accomplished by Mr. Davis and other foremen of the division during the same period is outlined in a letter to headquarters from Division Engineer E. Q. Sullivan.

Mr. Davis was leaving on his vacation when the storm occurred. He returned and with his crew worked from 2 o'clock on the afternoon of August 6th to 8:30 o'clock on the evening of the 7th without rest or food, Mr. Sullivan reports. Warning barricades, red lanterns, and other danger signals were placed and traffic assisted over the damaged section, which covered fifty miles.

Foreman E. J. Potter of Thermal also was out with his men in the early hours of the morning, while T. R. Goodwin and G. Harp of Newberry, on the National Old Trails route, worked for hours with the state's tractors towing traffic through four miles of flood water. Such efforts are typical of the faithfulness of the maintenance forces of the commission.

Answering Mr. Sullivan's report, State Highway Engineer R. M. Morton said:

> I have seen your letter of August 17th regarding the work of several of your maintenance foremen during recent flood conditions in your division.
>
> Please express to these foremen the appreciation of the headquarters' office for their efficient work.
>
> It is impossible for us to realize some of the efforts put forth by our employees as much as you do in the division office where you are more closely in touch with the conditions, but we know the important part of the highway work which devolves upon the maintenance foremen, and also the grief that can come to the whole organization when they do not do their utmost in serving the traveling public. I realize that we are too much inclined to take these efforts as a matter of course.



DESERT CLOUDBURST WORKS HAVOC—Scenes near Salton Sea, Imperial County, following recent summer cloudburst. State pavement was undermined and shoulders washed away for miles. It is impossible to anticipate damage by such storms, while repairs will cost thousands of dollars. (Photos by Div. VIII.)

STRAIGHT FROM THE CHIEF

(Continued from page 2.)

Some Have Inflexible Rule.

It is known that two or three of the divisions enforce an inflexible rule that if an article is taken out for use, even if only for one hour, a full day's credit is given to the Equipment Department. That is the kind of cooperation that is needed from all. In other divisions, the personal conscience is more elastic, and three or four days' minor use of equipment is reported as only one day.

If there is one fundamental in which an engineer must excel, it is in honesty. As the basis of his whole training is mathematical, he knows from repeated operations performed with figures that the answer to 2 + 2 is always 4. In the very nature of things, he must be honest to be worthy of the name of engineer. For maintenance foremen without this intensive training in personal honesty, there may be some excuse for misstating equipment use records, but for the engineer, there is none.

Must Have Equality of Reports.

It is impossible for the Equipment Department and the rental system to be successful unless all divisions are on an absolute equality in reporting rentals. The only possible standard of absolute equality is that the rentals shall be reported in accordance with the written rules and regulations, without deviation for any cause. This must be done throughout all the divisions; otherwise, the answer to the simple problem of 2 + 2 will not be 4, but will be something false, abhorrent to the engineer.

It can not be tolerated that the Equipment Department should derive its support from those divisions which are honest in making equipment returns, and that the others should be carried by the honest ones. The rental rates can never be reduced unless everybody reports on the same high standard in accordance with the rules and regulations. It would avail nothing to raise the rates to bring the Equipment Department more money, for increased rates would be only additional incentive to falsify. It would do no good to place equipment rentals on an hourly basis, for equivocation, if that is the division's policy, would still be possible.

Commission Back of Rental Plan.

Maintenance engineers and foremen, think this over! If you need more money to handle your work on account of making truthful equipment returns, face the issue like men and step up and tell us. The basic idea of the Equipment Department is right, and the management of the Highway Commission is behind it absolutely. We would prefer to allot you more money for your work, or to change your equipment to articles having lower rental rates, rather than see you compromise with your conscience and stultify your training as engineers.

You are on your honor.

HARLAN D. MILLER

May 5, 1880—October 19, 1926

HARLAN D. MILLER, chief of the Bridge Department, passed away at his home in Sacramento at 7.30 o'clock on the evening of October 19th. For months he had faced death, bravely and without complaint, keeping in touch with the duties of his position almost until the day of his death.

His passing ended six years of service for the California Highway Commission; four years as assistant bridge engineer and two years as head of the department, a position to which he was advanced by State Highway Engineer R. M. Morton on February 1, 1924.

Mr. Miller's appointment was followed by the inauguration of the plan of the State Highway Engineer for the centralized design and construction of all bridges. The department was expanded to include not only design of bridges, but all other details connected with their planning and construction. Bridge building which heretofore had been done to a considerable extent by the counties was gradually taken over by the state, making the department one of the major activities of the commission.

Under Mr. Miller's leadership an efficient and loyal organization has been built up, and several million dollars worth of work constructed. A thorough study of the railroad grade crossing problem also was started, and there was inaugurated a program of elimination of grade crossings.

Mr. Miller's work as bridge engineer has been characterized by the beauty and boldness of his designs. He believed that California bridges should be substantial, but that in their building beauty should not be sacrificed. Bridges built under his direction will stand for generations as monuments to his skill.

He fully appreciated that bridge building in California had lagged behind highway construction because of policy and lack of funds, and he hoped for a financing policy that would provide funds for many urgently needed structures, including hundreds of grade separations.

He did not live to see the consummation of his plans, but he laid the foundation for a construction program, the execution of which will bring credit to the commission and the state. Expressions of regret because of his untimely death have come from engineers, contractors, and editors in many parts of California and none have been more sincere than those from his associates and from the men of his own department.

Mr. Miller was a graduate of the Case School of Applied Science of Cleveland, Ohio, from which he held two degrees in Civil Engineering. He was a member of the Sigma Xi, the scientific honor society, and of the Phi Delta Theta fraternity. His work as a bridge builder in New York and elsewhere gave him considerable standing in his profession before he came to California in 1915 with plans for the bridging of San Francisco Bay.

He was a native of Ohio, forty-six years of age. A widow, one son, three brothers and a sister survive.

The Sacramento Chapter of the American Association of Engineers on October 21st adopted resolutions expressing the esteem in which the deceased engineer was held by members of his profession, and extending to the family the sincere sympathy of the Chapter.

PACIFIC HIGHWAY BRIDGE TO BE RENAMED IN HONOR OF HARLAN D. MILLER.

THE massive reinforced concrete bridge now under construction across the canyon of Dog Creek on the Pacific highway, in northern Shasta County, will hereafter be known as the HARLAN D. MILLER bridge to honor the late bridge engineer of the commission.

HARLAN D. MILLER.

This action was suggested by Mr. Morton and gladly authorized by the commission at its meeting in San Francisco on October 12th, when the following vote was adopted:

> Upon recommendation of the State Highway Engineer, it is VOTED, That the bridge now under construction across Dog Creek in Shasta County, road II-Sha-3-C, be designated as the Harlan D. Miller bridge, and
>
> IT IS FURTHER VOTED, That a plaque bearing suitable inscription thereon be placed on the above named bridge.

On the afternoon of the day of his death, Mr. Miller wrote a letter to Chairman Harvey M. Toy thanking the commission for its action.

The HARLAN D. MILLER bridge will be over 400 feet long with a central arch 234 feet long and 125 feet high, making it one of the spectacular structures of the state highway system. It was chosen as typical of the work of Mr. Miller as head of the Bridge Department.

HIGHWAY CELEBRATION.

(From the Santa Ana *Register.*)

The coast cities have cause for celebration.

And all Orange County rejoices with them in the opening of the state highway.

Sometimes it takes years to do what is easily seen as an advisable thing to do. It was years ago that the movement to join the beach resorts with a highway was started. It was years after the start before the project really got under way.

It remained for State Highway Commissioner N. T. Edwards to push the project through to its present state. A celebration by the coast cities for the purpose of offering their thanks to Commissioner Edwards in itself is worth while.

The celebration is worth while as marking the beginning of a new era in the development of the coast. Linked together with this highway, they are bound to receive an immediate impetus, which will carry on into continued activity and prosperity.

CARL F. HEINTZE PASSES.

Carl F. Heintze, formerly with Division III and more recently engaged as a contractor, died of pneumonia in a Sacramento hospital on October 11th. His passing was a shock to his many friends in the highway organization, who recalled his years of faithful service for the state. He served as resident engineer, superintendent of construction, and assistant division engineer. During the war he was a lieutenant of engineers.

Mr. Heintze was born in New Jersey in 1886 and was a graduate of the Rensselaer Polytechnic Institute at Troy, New York. The Sacramento Chapter of the American Association of Engineers, of which he was a member, adopted resolutions extending its sympathy and condolence to the widow and members of the family.

WHAT THE DIVISIONS ARE DOING

DIVISION V.

HEADQUARTERS, SAN LUIS OBISPO.

L. H. GIBSON, DIVISION ENGINEER.

Counties of San Benito, Monterey, San Luis Obispo, and Santa Barbara.

A CONTRACT has been awarded to Sam Hunter of Santa Barbara for the construction of 4.5 miles of highway between Carpinteria and Summerland. The contract calls for construction of a 30-foot Portland cement concrete pavement on a 40-foot roadbed centering on an 80-foot right of way.

State Takes Over Cuyama.

Division V recently took over the maintenance of a 38-mile section of road in the Cuyama Valley. It was graded by the Cuyama highway district and forms a part of the Santa Maria-Bakersfield lateral. This route, within Division V, extends from the Kern County line a short distance west of Maricopa through San Luis Obispo and Santa Barbara counties. A 16-mile section in the Santa Barbara National Forest was also completed recently by the Bureau of Public Roads in cooperation with the State of California.

Oiling operations in accordance with the latest California standards are under way in Division V on some of the recently completed rock-surfaced roads. Initial applications were made on recent improvements on the main Coast highway, Route 2, at "Death Curve," south of Paso Robles, and on the Pismo line change south of Pismo Beach. Portions of the gravel shoulders placed some time ago through Salinas Valley are also being oiled.

DIVISION VI.

HEADQUARTERS, FRESNO.

E. E. WALLACE, ACTING DIVISION ENGINEER.

Counties of Fresno, Madera, Merced, Mariposa, Kings, Tulare, and Kern, north of the Tehachapi.

WITH the cooperation of the Gilmore Oil Company and the Coast Rock Company, Division VI is trying out a "non-skid" surface for an asphalt concrete pavement near Fresno. Two sections of rock and one of pea gravel, placed across an intersection and a street car crossing, are being carefully observed to determine the best size of material to use.

Nearly three miles of 20-foot asphalt concrete pavement through Delano (recently completed by the Warren Construction Company, contractors; H. B. LaForge, resident engineer), shows a vialog reading of 15.9 units of roughness per mile. This is the record for smoothness for this type of pavement on a state job to date, the Construction Department announced.

Labor saving arrangement in use in Division VI for unloading rock for building shoulders.

Kern County forces are still grading on a three-mile section of the Walker Pass highway, which they expect to complete next month. Where the state has taken over the road it is smooth, fast and safe.

DIVISION VII.

HEADQUARTERS, LOS ANGELES.

S. V. CORTELYOU, DIVISION ENGINEER.

Counties of Los Angeles, Ventura, Orange, San Diego, and eastern Kern, south of Mojave.

GRADING work has been completed on the new coast highway between Laguna and San Juan Creek and placing of a 24-foot crushed rock surfacing is about finished.

Placing of crushed rock shoulders along the recently completed concrete pavement through the Malibu Ranch between Las Flores and Latigo creeks is nearing completion. The new pavement has not been opened to traffic as there are four bridges, now under construction by Los Angeles County, along this 6.3-mile section of highway.

Extending westerly from Latigo Creek to a connection with the completed Hauser contract in Ventura County, grading work, the only improvement contemplated at present, has been completed, except near the Arroyo Sequit where negotiations are under way to secure a right of way for a change of alignment.

Whittier Project Under Way.

The reconstruction of 3.2 miles of Whittier boulevard between Michigan avenue, Whittier, and the Orange County line is now well under way. Public utility lines have been moved to conform with the widening program, the right of way having been increased from 60 to 80 feet. The new pavement will be of cement concrete, 30 feet wide with two-foot crushed rock shoulders.

Jahn and Bressi, contractors, have commenced work on the paving of the famous Mountain Springs grade in San Diego and Imperial counties, where a 20-foot cement concrete pavement will be placed.

DIVISION VIII.

HEADQUARTERS, SAN BERNARDINO.

E. Q. SULLIVAN, DIVISION ENGINEER.

Counties of San Bernardino, Riverside, and Imperial.

SOUTHWEST Paving Company has started work in Riverside County where the section from Indio to six miles south of Coachella will be widened with Portland cement concrete and redecked with asphaltic concrete. The new width will be 20 feet. H. O. Ragan is resident engineer.

Widening of the pavement between Whitewater and Edom, also in Riverside County, has been completed. Cement concrete shoulders were placed to widen the section to twenty feet. The work was done by Matich Brothers and was completed well within the time limit. R. C. Payne was resident engineer.

Contract No. 491, commonly known as the Sand Hills job, is almost finished. The contractor has about completed oiling of shoulders and slopes as provided in the contract, but further oiling operations will be continued by the division maintenance forces. F. R. Baker has been resident engineer on this project.

DIVISION IX.

HEADQUARTERS, BISHOP.

F. G. SOMNER, DIVISION ENGINEER.

Counties of Inyo, Mono, and eastern Kern County, north of Mojave.

THE oiling program of Division IX "East of the High Sierra" has been completed. The work covered 38 miles of Volcanic cinders and decomposed granite surfacing between Lone Pine and Independence, including the main streets of Owen's Valley towns. Gilmore 60-65 road oil was used and the surface presents a decidedly improved appearance. Results so far are satisfactory.

A crushing plant equipped with primary and reduction crushers operated by two Cadillac power units has been installed near the crossing of the Los Angeles aqueduct between Independence and Lone Pine and a start has been made on the surfacing of a

10-mile section of the highway in this vicinity. Huston Cline is the foreman in charge. The installation of the crushing plant was supervised by W. E. Peck of the Equipment Department.

At Long Valley, in Mono County, grading of three miles of highway is now under way. Paul Peak is the foreman in charge. Fifteen men, twelve head of stock, a Bear Cat steam shovel, two tractors, and two rotary scrapers are employed on this job.

South of Bridgeport, Mono County, another section of 3.65 miles of road is under construction. Ray Flynn is the foreman on the job. Thirty men, a tractor, a rotary scraper, and 20 head of stock are employed.

DIVISION X.

HEADQUARTERS, SACRAMENTO.

R. E. PIERCE, ACTING DIVISION ENGINEER.

Counties of Amador, Calaveras, Alpine, Tuolumne, Stanislaus, San Joaquin, Solano, and southern Sacramento and Yolo counties.

PLACING of asphalt surfacing on the Modesto-Stanislaus river section of the San Joaquin Valley trunk highway has been completed by the Valley Paving Company. The work included placing of cement concrete shoulders and an asphalt concrete surfacing, the new width being 20 feet.

Placing of a cement concrete pavement at the approach to the M street bridge, at West Sacramento, is now well under way and the new approach to Sacramento will be ready for traffic in the near future.

Division X is making a study of the problem of providing better highway entrances for the city of Turlock. Similar studies are being made for the elimination of the Hatch crossing south of Modesto.

Improvements on Sonora Pass.

Improvements for the year on the Sonora Pass route in the vicinity of the pass were completed by Division X on October 1st. The work during the summer was concentrated largely

Improvements on Sonora Pass highway, Division X. New grade up Blue Canyon of Deadman's Creek.

on a section of several miles in what is locally known as the Blue Canyon of Deadman's Creek. Hundreds of rocky reefs which formerly lined the road have been blasted out and the new grade surfaced with local material.

Until about two years ago it was necessary to use low gear in traversing the nine miles approaching the summit. After the improvements of this year were completed, Division Maintenance Engineer Clarence Bovey made a test trip over the road and was forced to use low gear for but 1.5 miles. The work was done under the direction of Superintendent Ed Harris.

Other Maintenance Work.

Superintendent H. L. Montfort is in charge of extensive widening operations on the Big Oak Flat road between Carl Inn and the Yosemite Park boundary. Graveling also is under way on several sections of this route.

HIGHWAY NEWS NOTES

J. Q. McAndrew, assistant resident engineer on the Granite Construction Company contract at Hollister, has recovered from a serious illness and has again resumed his duties.

R. H. Lapp was recently transferred to Division V from Division VII. He is acting as assistant resident engineer at Hollister.

W. E. Sutton, recently transferred from headquarters to Division V, has been assigned as assistant resident engineer on the Santa Barbara-Goleta paving contract. He is acting as inspector at the asphalt plant.

R. A. Westbrook has been transferred from Division VI to Division V as instrument man.

P. L. Wilcox, recently transferred from Division VI to Division V is now resident engineer in charge of the Cornwall contract for widening pavement from Santa Barbara to Goleta.

They're All Girls.

The draftsmen continue to be stenographers in the family of Charles Fonteneau, who announced on October 10th the arrival of Betty Louise, his third daughter.

Division VII Notes.

R. D. Kinsey, assistant resident engineer, having completed his work on the Chalk Hill line change, has been transferred to the Whittier boulevard job where he will be assistant to A. N. George, resident engineer.

W. D. Eaton, resident engineer, on the recently completed Oceanside to San Onofre reconstruction project, has been assigned to the Mountain Springs grade paving job.

Transferred to Division X.

Dean I. Piper, formerly of San Francisco, is now a draftsman with Division X.

Leslie E. Ford is assistant resident engineer on the West Sacramento paving project, Division X.

Lawrence D. Kelsey, a former employee of Division III, is now a member of a Division X survey party working in Solano County.

C. M. Rosenberg, resident engineer, has been transferred from Division VI to Division VIII.

L. E. McDougal of the Maintenance Department is back on the job after absence because of illness.

Two line changes in Alpine County, one just east of Ebbett's Pass and the other in Hope Valley, have been completed by Superintendent Grant P. Merrill. They eliminate steep grades and improve the alignment. Widening work also is being done on the famous Kit Carson Spur.

Superintendent J. H. Gates has moved his crew to San Andreas after completing the season's work on the Big Trees route.

Widening and other improvement work on the Silver Lake grade has been completed for the season by Foreman F. M. Walker.

A special examination was given to the college football star who was deficient in chemistry in order that his scholarship standing be sufficient to enable him to play on the team. A rating of 50 was required to pass the examination.

Chem. Prof. "What is the color of blue vitriol?"

F. B. Star. "Green."

Chem. Prof. "You are wrong. Now give the chemical formula for sugar."

F. B. Star. "I do not know."

The answer to the last question being correct F. B. Star was permitted to resume his duties on the team.

Say it With Punctuation.

Many people often say what they do not mean because they do not know how to punctuate. A woman wrote this sentence this way: "Woman without her man is a savage." This is what she meant: "Woman! Without her, man is a savage."

Obliging.

Pedestrian: "Say—you just missed me."

Flivvering Fool: "Gee—I'm sorry. Tell you what to do—stand right where you are and I'll try again."—Selected.

STATE HIGHWAY FUND CONTRACTS (Bond Funds, Including Federal Aid)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE SEPT. 14, 1926.						
492	I	Humboldt	1	J	Across Big Lagoon	1.4	Grade and Surface and Timber Trestle	Mercer Fraser Co.	$157,782 38	Jan. 18, 1926	
494	VI	Mariposa	18	E	Across Bear Creek at Briceburg		Concrete Girder Bridge	Smith Bros. Co.	29,045 03	Mar. 17, 1926	
506	VII	Ventura	60	A	Between Point Magu and Little Sycamore Creek		Furnish and install Concr. Pipe Culvert	Christ Thoren	13,616 27	June 23, 1926	
					AWARDED SINCE SEPT. 14, 1926—None.						
					PENDING AWARD—None.						

NOTE.—Primary construction covered by the above contracts does not include funds obligated on cooperative forest highway projects, prison camp road activities, or day labor jobs not being done under contract.

STATE HIGHWAY MAINTENANCE FUND CONTRACTS (Including Gasoline Tax Fund)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE SEPT. 14, 1926.						
M-53	VII	Ventura	2	F, G	Sea Cliff to Rancho El Rincon	1.2	Rincon Sea Wall	J. H. Tillman Co.	$429,865 31	June 11, 1924	
M-77	I	Mendocino	1	J	Leggett Valley to 2 miles north of Rock Creek	6.3	Grade and Rock Surface	Butterfield Sears Co.	222,009 86	May 4, 1925	
M-123	VI	Kern	4	F	Between 1 mile S. of Delano and northerly boundary	2.77	Asph. Conc. Widening and Surfacing	Warren Const. Co.	55,776 38	May 7, 1926	
M-126	VIII	Riverside	26	D	Between Whitewater River and Edom	17.3	P. C. C. Pavement Widening	Matich Bros.	121,944 38	May 15, 1926	
M-129	III	Sacramento	3	B	Between Globe Iron Works and El Camino ave	1.14	Asph. Conc. Widening and Surfacing	Clark and Henery Const. Co.	32,443 88	June 8, 1926	
					AWARDED SINCE SEPTEMBER 14, 1926.						
M-147	VII	Orange	2	C	Through Tustin	1.6	Grading and P. C. C. Pavement	Griffith Co.	$72,021 97	Sept. 28, 1926	125
M-148	IV	San Mateo	2	A	Between Colma and Cypress Lawn Cemetery	1.6	Grading	Kaiser Paving Co.	128,262 24	Oct. 7, 1926	100
M-149	IV	Contra Costa	14	B	Between El Ciervo and Valona	1.8	Grade and Rock Surface	Tieslau Bros.	211,522 77	Oct. 12, 1926	175
M-150	VII	Los Angeles	4	E	Across La Placerita Creek		Two Concrete Slab Bridges	I. P. Lipp	17,926 54	Oct. 12, 1926	100
M-151	VII	Ventura	2	D, E, F	Between Ventura and Sea Cliff	8.4	P. C. Concrete Pavement	J. F. Knapp	459,288 73	Oct. 12, 1926	225
					Sub-total	13.40			$889,022 25		
					PENDING AWARD.						
	V	Santa Barbara	2	G	At The Ellwood Overhead Crossing	0.3	Grading and Rock Surfacing		18,609 75		100
	VII	Orange	60	A	Santa Ana River Bridge, near Newport		Cleaning and Painting		2,328 75		75
					Total State Highway Maintenance Fund Contracts Awarded and Pending Award	13.70			$909,960 75		

NOTE.—The above obligations charged against the State Highway Maintenance Funds do not include funds from these sources obligated for general maintenance and for specific betterments being done under day labor authorization.

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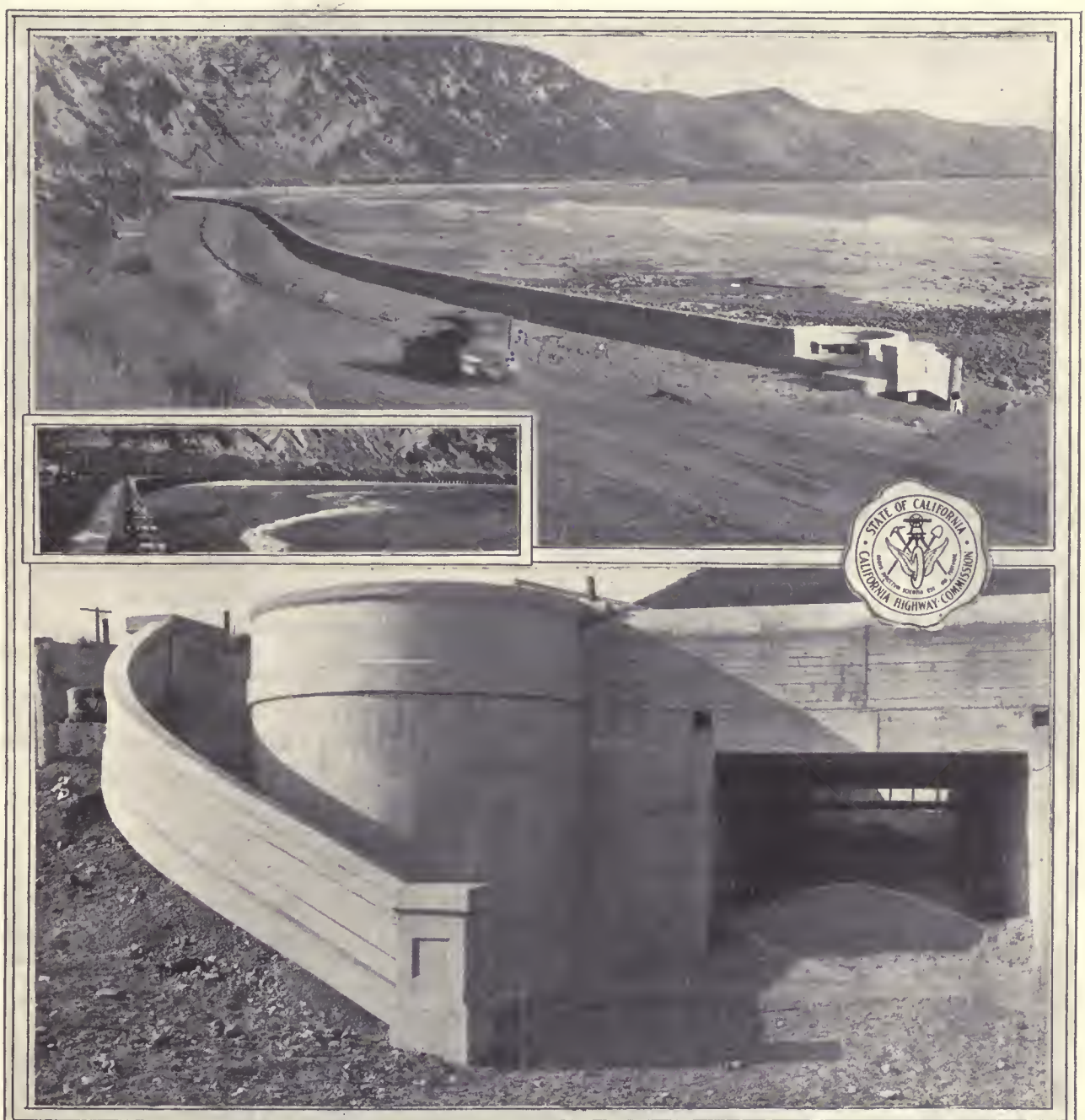

RINCON SEAWALLS—*Above,* long wall and fill at Rincon, Ventura County, showing relation of highway to ocean and Southern Pacific Railroad grade at left of view; *Below,* end of wall showing steps leading to beach; opening at right is culvert; *Insert,* at left center, old wooden causeway in use prior to construction of concrete seawall. (See article on page five.)

In this issue: BUSINESS METHODS IN THE EQUIPMENT DEPARTMENT—SIGHT DISTANCE AS A SAFETY FACTOR IN HIGHWAY DESIGN.

6 1926

CALIFORNIA HIGHWAYS

This Bulletin is published by the California Highway Commission for the information of its employees and the public. Editors of newspapers and others interested are welcome to use, without restriction, any of the matter herein contained. Cuts will be gladly loaned upon request.

FRANK B. DURKEE - - - - Editor

P. O. Box 1103, Sacramento, California.

Vol. 3 NOVEMBER, 1926. No. 11

CALIFORNIA HIGHWAY DEPARTMENT

FRIEND WM. RICHARDSON, Governor.

CALIFORNIA HIGHWAY COMMISSION

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L. H. GIBSON, Division V, San Luis Obispo

E. E. WALLACE (Acting), Division VI, Fresno

S. V. CORTELYOU, Division VII, Los Angeles

E. Q. SULLIVAN, Division VIII, San Bernardino

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RIGHTS OF WAY AND EMINENT DOMAIN

Securing of adequate right of way, particularly for the reconstruction of state highways, is becoming a problem of increasingly greater magnitude. Most of the divisions have been compelled to assign a member of the staff to the sole task of interviewing property owners, securing deeds, and straightening out right of way tangles.

The designation of a division right of way man requires exercise of careful judgment by the division engineer. Securing results is one part of the job; getting along with individual property owners, so as to keep their respect for the commission, is another very important part; together, they are a man-sized assignment for any one.

The engineer, or whoever undertakes the work, should have a thorough knowledge of the engineering necessity for the property sought; he should know local property values; he should be able to discuss convincingly the benefit which construction of the highway will bring; and he should know how to tactfully approach the property owner.

Although the right of way man has back of him the constitutionally granted right of eminent domain, he should never threaten. If deeds can not be obtained after every other reasonable means has been used, the procedure of condemnation which the state is thus forced to follow should be explained, but not used as a threat. The right of individual ownership of private property is one of our most sacred legal institutions. Right of way agents and engineers must always be sure they are acting according to law, when property rights are involved.

He who fills a public position is the servant of the people, not the master.

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EVERY employee of the highway commission has a direct interest in the improvement of the highway organization's methods and results, both engineering and clerical, office and field. To that end, the State Highway Engineer invites constructive criticism or suggestions from every employee.

Ideas as to the more economical and efficient ' 'ling of your job, or suggestions for elimination of waste will be welcomed. Criticism is also desired from persons outside the organization, who are in a position to give facts.

Send only signed communications addressed as follows: California Highways, P. O. Box 1103, Sacramento, Cal.

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UP-TO-DATE BUSINESS METHODS BRING ABOUT COMPLETE CHANGE IN EQUIPMENT DEPARTMENT

By R. M. MORTON, State Highway Engineer.

DURING the past two years a complete change has been effected by the California Highway Commission in the method of accounting for the cost of ownership and operation of equipment. A survey of our equipment situation several years ago showed that the commission's equipment consisted of trucks and automobiles acquired at low cost as excess war material, and a vast quantity of articles purchased from time to time for use on the maintenance of the various highway sections, or for special construction jobs.

The accounting system on this equipment was anything but satisfactory. Some equipment purchased under special allotments found its way into the equipment accounts. Other equipment was purchased with the money allotted for a construction or maintenance project, and perhaps found its way into the equipment accounts, but more likely remained as a direct charge against the job.

Repairs were charged to the job on which the equipment happened to be located when the repairs were made. This was a practice which led to much abuse, as those responsible for each job naturally endeavored to keep their equipment repair costs at a minimum. Equipment supposed to be in good condition on release was found, upon receipt on the next job, to be in poor condition, and extensive repairs were usually required before it could be used. As the estimates of cost for doing new jobs usually included no equipment repairs, there was constant friction between the repair department and the division employees in regard to the condition of equipment. The central office was constantly required to make additional allotments to cover the repairs not included in the original job estimates.

Results of Former System.

In the absence of proper accounting methods, there was only an indifferent check on the amount of equipment owned by the state. It was supposed that the excess war equipment constituted an asset far larger than the ledger cost, which assumption has been found to be correct. However, the divisions were all guilty of the practice of hoarding equipment; that is, obtaining everything they could lay their hands on and keeping it for some future emergency, when they might have a few days' use for it. This practice cost the state extra money, for the reason that new articles were sometimes purchased, which duplicated idle equipment not reported as being available for transfer.

R. H. Stalnaker, equipment engineer of the highway organization, was encouraged by the State Highway Engineer to dig into this mess of inaccurate and confusing detail, and to bring forth a recommendation for improving conditions. It did not take him long, with the help of other engineers of the department who realized the situation, to visualize and recommend an entirely different system for handling the Highway Commission's equipment. The Highway Commission, for the past two years, has been working under the new system. We are proud to set forth the details of a system which we believe is as nearly perfect as it needs to be for the use of the state highway organization.

Basis of Present Plan.

The basis of our present system of handling equipment is that all articles, except those classed as small tools, are on a rental basis. Rentals are charged either daily or monthly, in accordance with the use of the article. Under the new system, the maintenance equipment on each section of road is paid for from the allotment set up for maintenance of that section, just the same as are the wages of the men, or the materials purchased. On the construction jobs, such as the convict camps, the same thing applies. Shovels and other large equipment are paid for on a shift basis. Equipment used more than one shift is paid for accordingly.

The rental rates include the estimated cost of repairs, and depreciation. The job pays for the running or operating expenses. The rental receipts are placed to the credit of the equipment funds, and from these funds is defrayed the cost of operation of the Equipment Department, and the operation of the various shops owned by the state. Not only does the Equipment Department make shop repairs in each of the divisions, but it also renders such service as sending mechanics from the shops to the field and maintaining field mechanics to make emergency repairs.

Department Now Self-Supporting.

From the gross rental credit receipts, there is deducted the cost of repairs and cost of operation of the Equipment Department. The balance constitutes a depreciation reserve. From this fund are purchased new articles of equipment to replace those which have become obsolete or have worn out in service. Therefore, the Equipment Department has become self-supporting.

It has been found that close estimates of equipment charges can be made at the beginning of new jobs. Reports on costs of performing maintenance or day labor work are now accurate. No longer do we have to make excuses for our cost data in so far as equipment is concerned.

The inauguration of the rental system and its successful use has been coincident with the construction of several up to date shops for equipment repairs. Adequate shops have been constructed at Redding, Fresno, Lankershim, San Bernardino, Bishop and Crescent City during the past three years.

Drastic steps have been taken by the Equipment Department to clean up all the obsolete articles, junk, etc., which have been accumulating for years around the premises owned by the State Highway Commission. Thousands of dollars have been realized from the sale of junk and second hand equipment, and placed in the equipment fund. A proper inventory has been prepared, and the Equipment Engineer and his assistants have at their fingers ends the complete history of every article of equipment. The history includes its financial record, and they know whether or not it is making money.

This information enables us to avoid loading up with articles which look good but for which we do not have sufficient use to make their ownership a paying proposition. Gradually, the Equipment Department is able to concentrate its purchases on those articles which our experience informs us are money makers.

Centralization of authority over the equipment has inevitably led to quantity purchases. Quantity purchases of standardized articles are made, resulting in saving much money over prices

(Continued on page 9.)

PICKFORD AND FAIRBANKS HELP DEDICATE HIGHWAY

SOUTH COAST BEACHES JOINED BY HIGHWAY.—Douglas Fairbanks, *center,* as the blacksmith, forges chain which binds together communities from Long Beach to Serra, while Mary Pickford, *left,* "Spirit of Progress," gives her blessing; *center rear,* Division Engineer S. V. Cortelyou of Division VII; *right,* Commissioner Nelson T. Edwards; *extreme right,* Supervisors S. H. Finley and George Jeffrey of Orange County. The celebration was held at Laguna Beach on October 9th.

CONFIDENT of what the new state highway means to the future progress and prosperity of their respective communities, residents of the south coast cities celebrated recently the opening of the Newport-Laguna unit of the Oxnard-San Juan Capistrano highway. An allegorical pageant over the new coast route ended at Laguna in the forging of a great symbolic chain of friendship, linking together the beach communities from Long Beach southward to Serra. The internationally known motion picture actor, Douglas Fairbanks, as mighty Vulcan, welded the links together, while his no less famous wife, Mary Pickford, presided over the scene as the "Spirit of Progress."

Members of the board of supervisors of Orange County, who have assisted the state by financing the erection of a number of expensive bridges, the mayors of the several cities in route, and representatives of civic associations and chambers of commerce were among those participating. The State Highway Department was represented by Commissioner Nelson T. Edwards and Division Engineer S. V. Cortelyou of Division VII.

The completion of the Newport-Laguna contract opens to traffic the new coast highway from Long Beach to Serra, where it joins the original Los Angeles-San Diego state highway. Considered by the commission one of the trunk highways of the state system, work has gone steadily forward over a period of several years, and, while yet incomplete, the highway is already carrying a considerable traffic.

Description of Work.

The most recent project, the Newport-Laguna contract (No. 479 Orange 60 A & B), covers a distance of 9.8 miles, four miles of which was paved with Portland cement concrete and 5.8 miles surfaced with bituminous macadam. The cement concrete pave-

SEAWALLS REPLACE WOODEN TRESTLES ON VENTURA COAST

AFTER more than two years of effort a massive reinforced concrete seawall now protects the coast state highway where it passes along the ocean beach from Sea Cliff to Ranch El Rincon in northern Ventura County. The contract, awarded to the J. H. Tillman Company of Portland, Oregon, on June 11, 1924, was accepted by the commission on October 12, 1926.

Completion of the work a few weeks ago ended a two-year battle to wrest from the surf a strip of land 6400 feet in length and sufficient in width for the placing of an adequate pavement. The seawall was necessary because the only other available location is already occupied by the tracks of the Southern Pacific railroad, and for the further reason that the light wooden trestle that formerly carried the highway was rapidly falling into a state of dilapidation that made it beyond repair.

Nearly 16,000 cubic yards of high quality concrete went into the building of the huge seawall which rests on a firm foundation of shale and gravel beneath the sands of the beach. The wall averages sixteen to eighteen feet in height, but by far the greater portion is hidden from sight beneath the surface of the beach.

Wall Has Proved Effective.

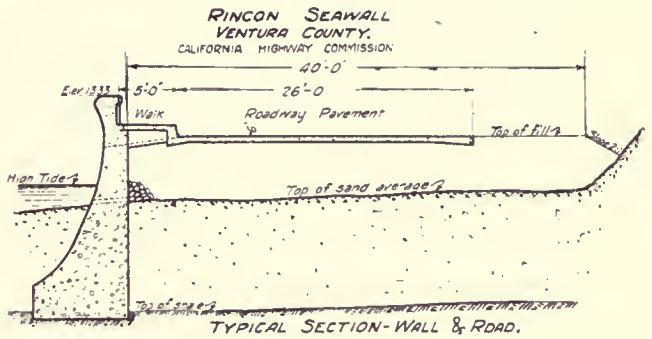
The Santa Barbara earthquake did no damage to completed sections of the wall, but did delay the contractor's operations. At another time during construction the work was again interfered with by a coastal storm of almost unprecedented severity. Completed sections of the wall, however, proved its effectiveness as a protection for the highway.

The space back of the wall has been filled with sand and the old trestle removed. Removal of the trestle was done by Division VII and proved a difficult undertaking because of the necessity for keeping the highway open for travel. Great credit for getting the job done with a minimum of inconvenience to the public is due Maintenance Superintendent Louis Prosper. He and his crew kept traffic moving in rain and storm while the work was under way.

The Bridge Department, too, is proud of the work of C. O. Dingle who served as resident engineer for that department during the long period the project was under construction. The Ventura seawall was planned and built during the period when the late Harlan D. Miller was head of the department and is one of the structures in which he took justifiable pride.

Pavement Next Year.

When the fill back of the wall has settled sufficiently, there will be constructed upon it a pavement of ample width to care for the traffic over this section. In addition there will be parking space for vehicles and a sidewalk for pedestrians inside the parapet. The ends of the wall have been finished with ornamental stairways which lead to the beach.



Completion of the pavement, which is planned for next year, will transform one of the worst sections of the Coast route into one of the most attractive. The work is classed as reconstruction and is being financed from the gasoline tax funds. The cost of the work done by the Tillman Company was approximately $430,000. (See illustration on front cover.)

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ment was placed 20 feet wide and seven inches thick with nine-inch edges and center, and five-foot rock borders.

The macadam was placed 20 feet wide and six inches thick. It is composed of a water bound macadam base, 4½ inches in thickness, and a surfacing of 1½ inches of oil macadam.

Work was begun by Kavanaugh and Twohy, contractors, in September, 1925; the project was accepted by the commission on November 16th. Omission of paving on a part of the project was due in part to lack of funds. With the completion of this unit, however, the initial improvement has been completed from Long Beach to the Serra connection, with the exception of a short section at the mouth of San Juan Creek and two subways under the Santa Fe tracks at Serra. The construction of the latter, it is expected, will be under way shortly.

Some damage was done to the newly completed work on this project by the heavy rains last spring, and considerable replacement of embankment and enlargement and repairs to the drainage system is now under way.

Holds Record for State.

The cement concrete pavement placed on this project is notable because of the exceedingly smooth riding surface obtained and the unusual strength recorded by tests of samples of the mix. **A vialog test of the four miles of pavement showed an average roughness of only 4.8 inches per mile, the smoothest section of pavement yet completed on the state highway system of California. Forty-five test cylinders of concrete showed an average compressive strength of 5305 pounds per square inch at the end of twenty-eight days. This also is a record for California, and undoubtedly compares favorably with such pavements being built elsewhere.**

The resident engineer on this project was R. L. Thomas of Division VII. He was assisted by L. R. McNeely, as inspector at the mixer. Winthrop Aldrich was assistant during placing of the waterbound macadam base. Bryan H. Allen was inspector of subgrade, while Charles A. Lane served as inspector at the proportioning bunkers at Newport.

Other sections of the new coast route, south of Long Beach, completed by the incumbent highway commission include the paving between Huntington Beach and Newport and the grading and surfacing between Laguna Beach and Serra.

RUSH WORK.

Teacher: "When was Rome built?"

Boy: "At night."

"Who told you that?"

"You did. You said Rome wasn't built in a day."—*Sunshine Bulletin.*

Sight Distance as a Safety Factor in Highway Design

By Freo J. Grumm; Engineer of Surveys and Plans.

IT HAS been truly stated that "the real problem on our highways is not poor design but incompetent and careless driving." The method that first presents itself of dealing with this problem is the more vigorous enforcement of our traffic laws. Enforcement of the law will probably always be the most effective means even though the question, whether the provisions of the law are correct or can be improved upon, is always open. A substantial contribution, however, to the safety of the road user, to the protection of the careful driver from the careless driver, is the provision for long unobstructed view or ample sight distance.

It is obvious that a long, clear sight distance adds to the road user's comfort, since it allows for maintenance of a more uniform speed. It adds also to his safety, as it provides for ampler distance in which to bring his car to a stop, when this is necessary.

One of the conditions to which a motor vehicle operator must conform, in order to be called a "safe driver," is to operate his vehicle at such a speed that it can be stopped within the distance that is sure to be free from obstruction. The driver is not responsible for road or traffic conditions which may affect the unobstructed lane or course in which his car will travel. He is responsible, however, for being able to stop his car, whenever necessary, within the unobstructed course.

There are several factors on which the distance required for stopping depends: the speed of the car, the surface of the road, the condition of the brakes and the reaction time of the driver. Disregarding for the moment the influence of road and traffic conditions, it may be possible to establish the relation between stopping distance and sight distance if proper values can be found for these factors.

A definite relation can be stated between the speed of a car and the stopping distance under certain given conditions. Experiments and investigations conducted by automotive engineers supply reliable data. In applying these to average conditions of vehicle and road, we are compelled, in the interest of safety, to accept for consideration as a standard, the stopping distance required by the most poorly braked car. Studies conducted by the United States Bureau of Standards indicate that perhaps the highest standard we may expect to enforce is a stopping distance of 50 feet from a speed of 20 miles per hour.

What Studies Show.

In the following tabulation are shown the rate of speed in miles per hour and in feet per second, the stopping distances for two-wheel and four-wheel brakes published by the Thermoid Rubber Company, the stopping distances from an actual test of a two-wheel brake car, and those derived from studies of the United States Bureau of Standards. The stopping distances are from the time the brakes are applied until the car comes to a full stop. The prescribed conditions are a dry, level road, and a uniform deceleration from a known to a zero velocity.

Rate		Stopping Distance (Feet)			
Mi. pr. Hr.	Ft. pr. Sec.	*2 Wh. Brakes**	*4 Wh. Brakes**	Actual Test**	U. S. Bureau Standards
10	14.66	9.2	6.17	9.0	12.5
15	22.00	20.8	13.9		28
20	29.33	37	24.7	34.9	50
25	36.66	58	38.6	53.6	78
30	44.00	83.3	55.5	74.4	112
35	51.33	113	75.6		153
40	58.66	148	98.7	135.5	200
45	66.00	187	124.9		253
50	73.33	231	154	178.0	312

*From Thermoid Rubber Company Chart.
**With brakes in proper adjustment.

SIGHT DISTANCES, 100 FEET TO 500 FEET.

Sight Distance	Radii of Horizontal Curve					Length of Vertical Curves — Algebraic Difference in Grade Rates					
	#1	#2	#3	#4	#5	14	12	10	8	6	4
100'	120	100	Less than 100' Radius.				Less		than 100	foot	
150'	260	220	190	180	170					Vertical	
200'	440	380	330	310	290	110				Curve	
250'	690	580	500	470	450	210	170	100			
300'	1000	840	720	670	640	320	270	200	100		
350'	1340	1150	970	910	860	430	370	300	200		
400'	1750	1500	1260	1190	1130	560	480	400	300	130	
450'	2220	1880	1590	1500	1420	710	610	510	400	230	
500'	2730	2330	1970	1870	1760	880	750	620	500	330	

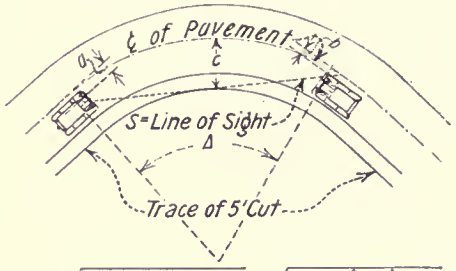
ASSUMPTIONS

(1) 20' Standard Roadbed, 18' Pavt. $\frac{1}{2}$:1 Cut slope, a=4 b=2' c=14$\frac{1}{2}$'
(2) 20' " " " " " 1:1 " " } " " c=16$\frac{1}{2}$
24' " " " " " $\frac{1}{2}$:1 " "
(3) 24' " " " " 20' " 1:1 " " } " " c=19'
26' " " " " " " $\frac{1}{2}$:1 " "
(4) 26' " " " " " " 1:1 " " " ",c=20'
(5) 28' " " " " " " " " " " ",c=21'

MINIMUM Δ FOR SIGHT DISTANCES

R	1	2	3	4	5
100	57°	61°	67°	69°	71°
200	40°	43°	46°	48°	51°
300	32°	35°	38°	39°	40°
400	27°	30°	32°	34°	34°
600	22°	24°	27°	27°	28°
800	19°	21°	23°	24°	24°
1000	17°	19°	20°	21°	22°
2000	12°	13°	14°	15°	15°

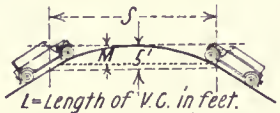
HORIZONTAL CURVES



$$S = \sqrt{16 + 2R(c-4) - c^2} + \sqrt{4 + 2R(c-2) - c^2}$$

VERTICAL CURVES

(Vision point 5 feet above Pavement.)



L=Length of V.C. in feet.
S=Sight Distance in feet.
M=Middle Ordinate in feet.
G=Algebraic Diff. in Grade Rates expressed as an abstract number, as 6%-6.

$$M<5\begin{cases} S = L + \frac{2000 - 400M}{G} \\ L = 2S - \frac{4000}{G} \end{cases} \qquad M>5\begin{cases} S = \sqrt{\frac{4000L}{G}} \\ L = \frac{GS^2}{4000} \end{cases} \qquad M = \frac{LG}{800}$$

CALIFORNIA HIGHWAY COMMISSION

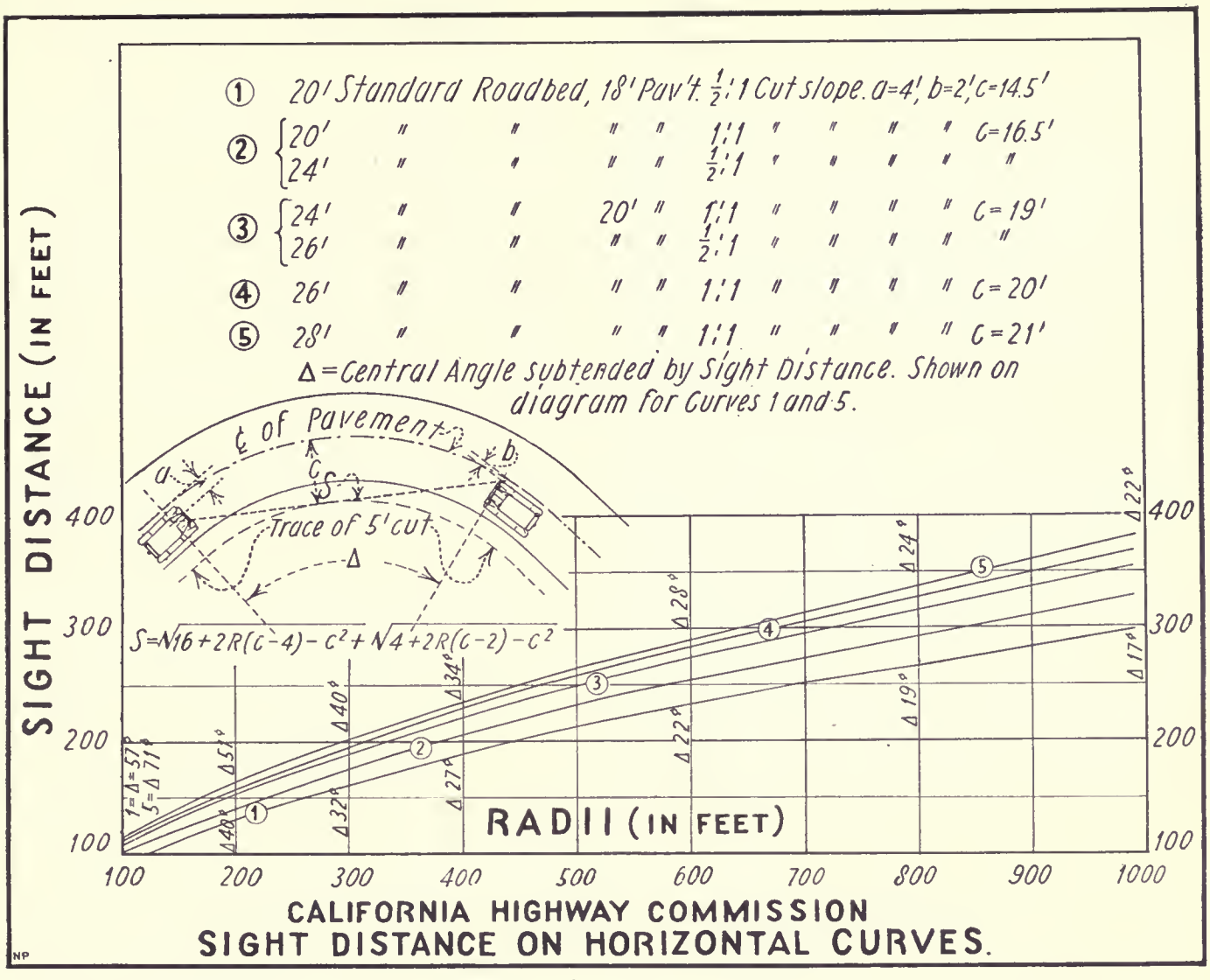
TABLE OF

SIGHT DISTANCES

FOR

HORIZONTAL AND VERTICAL CURVES

SEPT. 1926


① 20' Standard Roadbed, 18' Pav't. ½:1 Cut slope. a=4', b=2', c=14.5'
② 20' " " " " 1:1 " " " " c=16.5'
24' " " " " ½:1 " " " " "
③ 24' " " 20' " 1:1 " " " " c=19'
26' " " " " ½:1 " " " " "
④ 26' " " " " 1:1 " " " " c=20'
⑤ 28' " " " " 1:1 " " " " c=21'
Δ=Central Angle subtended by Sight Distance. Shown on diagram for Curves 1 and 5.
℄ of Pavement
Trace of 5' cut
S=√16+2R(c-4)-c²+√4+2R(c-2)-c²
SIGHT DISTANCE (IN FEET)
RADII (IN FEET)
CALIFORNIA HIGHWAY COMMISSION
SIGHT DISTANCE ON HORIZONTAL CURVES.

The corresponding values in columns 3 and 5 show a fairly close agreement except for the higher speeds. The stopping distances for cars with two-wheel brakes, shown in the last column, are based on a coefficient of friction between tire and road of 0.6 and a ratio of 0.25 for the height of center of gravity to length of wheelbase of the car, from which factors a deceleration of about 9 feet per second per second results.

With the alteration of the given conditions, such as a wet road, a downhill grade or inadequate brakes, the values in the table are immediately increased. The friction coefficient on a wet road may drop to 0.1 or 0.2 causing a nearly proportionate decrease in the deceleration, which may have a value as low as 2 feet per second per second. This means that either the stopping distance is increased from 3 to 4 times or that the initial speed must be decreased one-half or more in order to stop within the same distance.

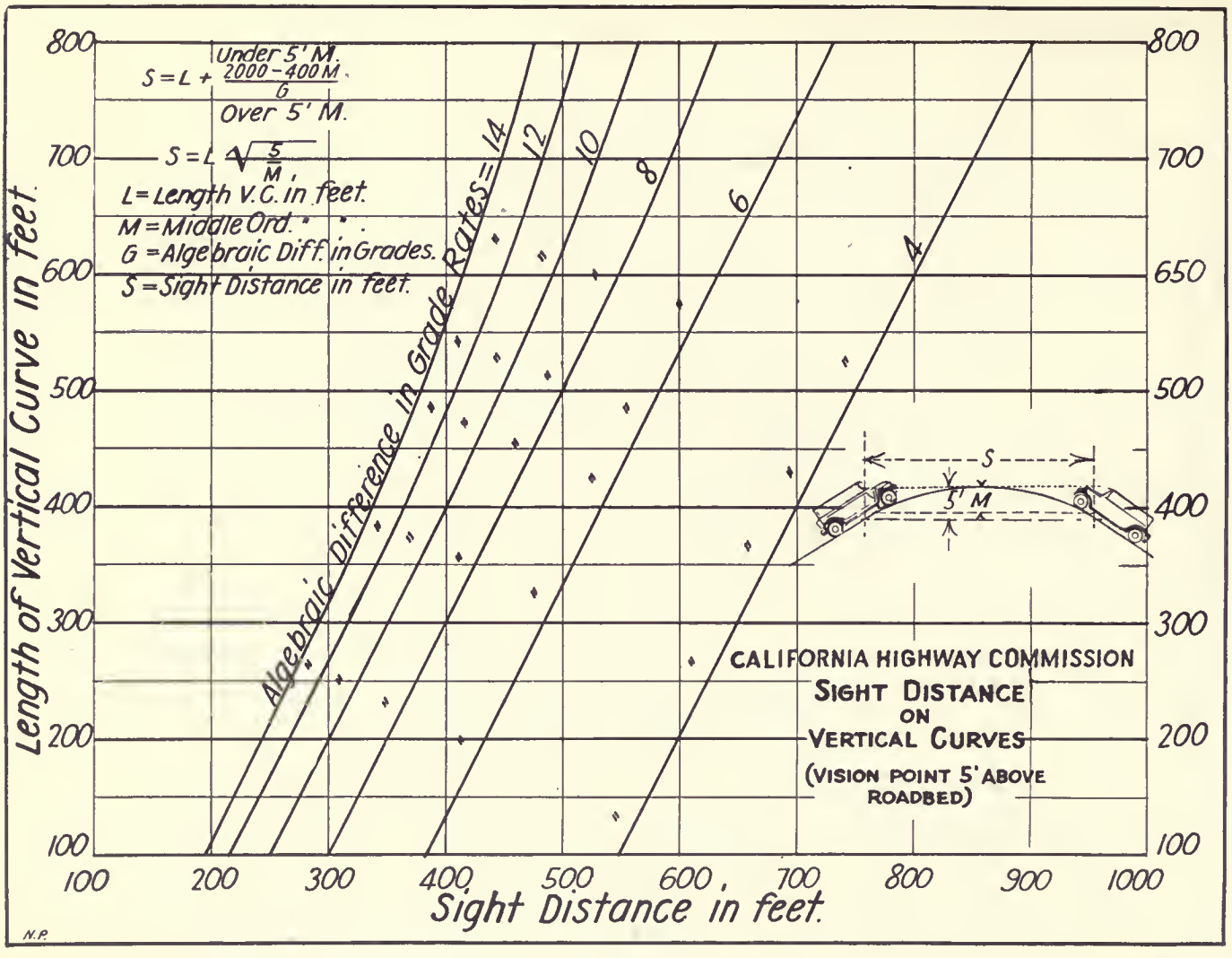
For instance, at a dangerous intersection, the sight distance and unobstructed course ahead is 65 feet. In this distance, the driver must be prepared to see an approaching car, decide to stop, apply his brakes and bring his car to a full stop. With good brakes and no loss of time on his part, he could accomplish this if he were driving on a dry road at a speed not in excess of 20 miles per hour. If the road is wet and slippery, however, he probably can not make the stop from a speed greater than 10 miles per hour. Evidently, then, the stopping distance with relation to the unobstructed course, which involves the sight distance, is the more important factor of safety and determines the safe speed at which a car should be driven.

In the above cited example, the other factor affecting the stopping distance is given consideration, namely, the personal equation, or the reaction time of the driver. Some interesting experiments in this connection were conducted in Washington, D. C., by Messrs. F. A. Moss, staff psychologist, Bureau of Public Personal Administration, and H. H. Allen, assistant mechanical engineer, Bureau of Standards. It was found that the average reaction time of the persons tested was approximately one-half second, that the reaction time was not appreciably affected by the speed at which the person was driving, and that reaction time may be reduced by training.

If to the stopping distance shown in the tabulation is added the proportionate distance in feet per second required by the reaction time, a fairly definite value is obtained of the total distance necessary to safely stop a car from a given rate of speed.

Relation of Stopping Distance to Sight Distance.

The relation of the stopping distance to the unobstructed course is clearly similar to that of stopping distance to sight distance, since the unobstructed course is determined by the sight distance. This may be shown by the case of the horizontal curve. On a curve, the view may be obstructed by embankments, buildings, trees or bushes. The driver, say on a curve to the right, can see his right-hand side of the road for a definite distance. If in this



distance, he sees no obstructions, such as vehicles, pedestrians or animals, he has an unobstructed course equal to his sight distance, but no more. The sight distance, then, determines the safe stopping distance, which in turn determines the safe speed at which the driver may proceed.

It is assumed that each vehicle is proceeding in its own lane or course. Law and custom have well established this practice as one of the commonest rules of the road. Even the careless, senseless driver must experience some pangs of conscience when he causes confusion or narrowly escapes accident by the violation of this accepted principle, and here, especially, the safety afforded by long sight distance is obvious. When the lane of travel becomes a common one, as in the case of a single track road, it is clear that the unobstructed course is only one-half of the distance which the driver can see, as each driver of two vehicles approaching each other at equal rates of speed must stop within one-half the distance separating them when they first sight each other.

In the case of the other type of curve, that is, the vertical curve over the top of a hill, the situation is similar to the horizontal curve, but it seems that the average driver is not so strongly impressed with this similarity and has not yet acquired the full appreciation of the relative hazard to traffic which the vertical curve presents. It seems advisable, in this case, to provide even a larger safety factor by increasing the sight distance generously beyond what is theoretically required.

Engineer Designs Illustrating Graphs.

The accompanying tables and graphs, designed and prepared by B. W. Booker, office engineer of Division I, show, for various widths of roadway, the length of radius on horizontal curves and length of parabolic vertical curves necessary to obtain a given sight distance. The line of sight is at a height of five feet. For horizontal curves, the sight distance is measured between points on the inside lane and is consequently the shortest distance. The driver is concerned principally in seeing the lane in which he expects to travel; if this is clear, he may proceed safely.

A concrete example applying the data and tables may be of interest. From the sight distance table, assuming a 24-foot standard roadbed, 20-foot width of pavement, 1 to 1 cut slopes, we find that a curve with radius of 500 feet will provide a sight distance of about 250 feet. An unobstructed course of this length, with the ideal conditions of a dry, level road and allowing a margin of only one second in addition to the required reaction time, would permit of a speed of 35 miles per hour in rounding this curve.

In discussions of this subject, it is not uncommon to have cited an example of two cars approaching each other at an equal rate of speed; the conclusion is then made that the sight distance necessary to provide for safety is the sum of the required stopping distances for both machines. This, obviously, is true only where the two cars are traveling in the same lane. Its application to a roadway of two lanes or wider, and providing the sight distance necessary for higher speeds, would soon carry us beyond all bounds of economy in our construction.

It is interesting to note the comparison of sight distances on horizontal and vertical curves. For instance, where minimum radii of 200 and 300 feet are used on heavy work, a 150-foot vertical

(Continued on next page.)

SAND HILLS PAVING PROJECT IS PRAISED AT EL CENTRO DINNER

GOOD roads enthusiasts from southern California counties and also from Arizona gathered at a banquet in El Centro on October 27th to celebrate the recent completion and opening to traffic of the new pavement across the Sand Hills of Imperial County.

Numerous speakers, as reported by the El Centro *Press,* gave unstinted praise to the skill of the engineers who planned the seven miles of new asphaltic concrete pavement across the dunes and to the contractors who built it. Appreciation also was expressed for the interest taken by the highway commission in the improvement of the trunk highways extending through Imperial County.

Among the guests who addressed the gathering was Commissioner Nelson T. Edwards, who expressed pride in the accomplishments of the commission in the state as a whole and also on the Borderland route between El Centro and Yuma. Details of the Sand Hills project were related by E. Q. Sullivan, division engineer of San Bernardino. The Mountain Springs grade project was described by S. V. Cortelyou, division engineer of Division VII.

The Chamber of Commerce of El Centro was host for the evening and W. W. McEuen, president of the chamber, presided. The program was arranged by George E. Bowles, chairman of the Good Roads Committee.

The new Sand Hills highway, it was reported, has reduced the running time between El Centro and Yuma forty-five minutes besides greatly increasing the comfort of the trip across the desert.

EQUIPMENT DEPARTMENT NOW FUNCTIONING MORE EFFICIENTLY

(Continued from page 3.)

quoted for an occasional purchase. Heavy quantity purchases have been made of road graders, tractor grader outfits, truck repair parts, etc.

To take care of the accounting for the vast number of articles owned by the Highway Commission, there has been installed in the headquarters shop and in all of the division shop offices, an accounting system handled with bookkeeping machines. Transactions are closed daily, and stock cards balanced. The Equipment Department always knows where it stands financially.

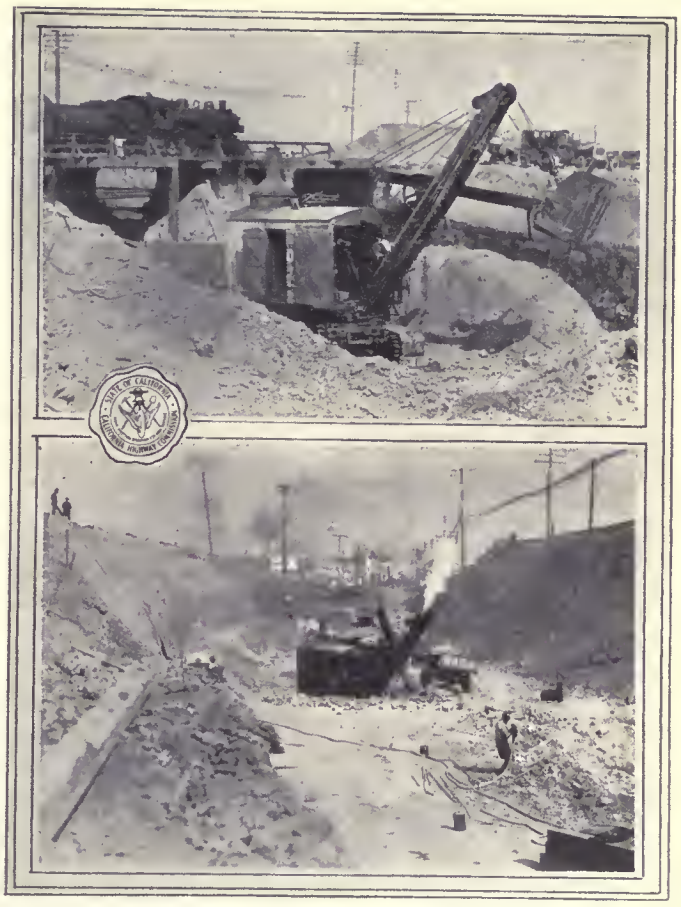
The machine bookkeeping system has been worked out by one of the accountants of the Board of Control, Mr. C. E. Malm. Mr. Malm's vision of the proper accounting system for our Equipment Department has resulted in a system which gives us far more data than we ever had before, and the best part of it is that it gives it quickly and accurately.

Several years ago, we made excuses for our Equipment Department. Now, through the hard work of Mr. R. H. Stalnaker, and the cooperation, advice and assistance of Mr. Malm, we make excuses no longer. We are proud of the department, and would not return to the old methods under any circumstances. We challenge any organization to bring forth a better system than we have or equipment better taken care of. Gradually, as we dispose of obsolete material, and the old equipment is replaced by new and up to date equipment, our maintenance costs will decrease.

With both the manufacturers and the Highway Department working on design of specialized equipment, and trying to find the best article to suit the job, economy is bound to result.

Hostess' daughter (trying desperately to keep the conversation going)—"Did you ever hear the joke about the curio dealer who had two skulls of Columbus—one when he was a boy and the other when he was a man?"

Wiggins—"No; I don't think I have. What is it?"



BAYSHORE UNDERPASS—Rapid progress is being made on Bayshore highway underpass at South San Francisco, ground for which was broken on August 28th. It will be the largest to date on the state highway system.

SIGHT DISTANCE

(Continued from page 8.)

curve gives considerably more sight distance, even with a 12 per cent grade change. A combination of horizontal and vertical curve will slightly reduce the sight distance shown in the tables. The amount of this reduction is indicated by the following: A 300-foot radius curve, in combination with a grade change of over 10 per cent, reduces the sight distance 15 feet from that shown on the horizontal curve diagram.

The setting forth of these values of stopping distance does not mean that the principle of adopting minimum sight distance to meet the requirements is advocated; it is the hope, rather, that with more definite and ample information, realizing the tendency to increase driving speeds, a better understanding of the requirements of comfort and safety may be had and that we may more intelligently provide for these in future design.

By the introduction of superelevation, we overcome the riding discomfort produced by the short radius curve; we add materially to both comfort and safety by building our highways wide; but the average driver has greater peace of mind and a greater feeling of security when the road lies open and unobstructed before him; when he can see clearly the way ahead.

National Good Roads Week January 10-17, 1927.

THE second National Good Roads Week has been named as the week beginning January 10, 1927, according to H. G. Shirley, president of the American Road Builders' Association. The chief event of the week will be the road show and convention in Chicago at which many highway authorities are expected to gather for a comprehensvie program of review, discussion of problems, and planning for the future of the industry.

COUNTY BRIDGES ON MOTHER LODE HIGHWAY REBUILT BY STATE

UNDER chapter 234 of the Statutes of 1925, the California Highway Commission was directed to take over for maintenance various county roads on designated state highway routes. Typical of the roads taken over is Route 65 from Auburn to Sonora, commonly known as the Mother Lode Highway.

When maintenance forces took charge of this route, many of the bridges were found to be far below the standards of the state and some were in an unsafe condition. An example of such structures was the bridge across Mokelumne River between Jackson and San Andreas, consisting of a steel truss center span and timber trestle approaches. This bridge, originally built many years ago as a toll bridge, had been later taken over by the counties.

Four caps in the trestle were of wood and badly rotted, all other caps were constructed of two pieces of channel iron and were in good condition. The stringers were spaced too far apart and all were badly rotted; the floor planks were so badly worn that logitudinal plank runners had been installed to carry the traffic. The clear width of the bridge was less than thirteen feet and the structure accommodated only one-way traffic.

Under specific authorization the super-structure was entirely rebuilt. The four defective caps were replaced, new stringers, deck, guard rail and wheel guard were placed throughout. The deck was widened as far as the steel caps and truss would permit, making a clear width of 14 feet between guardrails, which allow vehicles to pass one another while on the bridge. A laminated deck of 2" x 4" stock took the place of the old type deck and standard guard rails with 8" x 8" wheel guard replaced the old rickety guard rail. Repairs are now finished with the exception of asphalt macadam surfacing for the floor.

Fifty-five thousand board feet were required to reconstruct the bridge and the entire cost stands to date at $3,350, including cost of all materials and labor.

The bridge over the North Fork of the Calaveras River, consisting of an old 162-foot combination Pratt truss, was found to be in very bad shape. Woodpeckers and rot had weakened the timbers in the truss until they were no longer safe. Special allotment authorized the placing of concrete footings and frame bents under the six panel points.

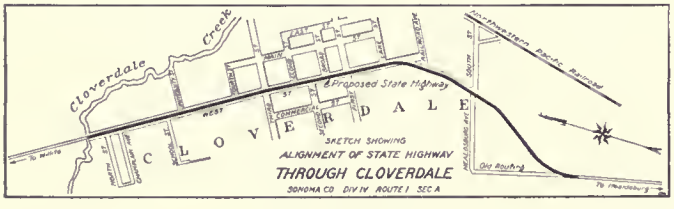
Other small structures along this route have been strengthened so that all are now safe for ordinary travel. In another year, however, decks of several structures will need replacing.

Pictures showing "before" and "after" views of the Mokelumne River bridge are shown herewith. The work was done by the regular maintenance forces of Division X under the direction of Maintenance Engineer Clarence Bovey.

MOTHER LODE IMPROVEMENTS—*Left*, Mokelumne River bridge when taken over from county; *Right*, bridge with deck and floor rebuilt by forces of Division X. (Photos by Division X.)

NEW PAVEMENT THROUGH CLOVERDALE IMPROVES ALIGNMENT

DANGEROUS curves at the southerly approach to the town of Cloverdale on the Redwood highway, Sonoma County, have been removed by the completion of the paving contract of J. V. Galbraith (Contract 510, IV Son. 1-A). The new 20-foot concrete pavement has been completed through the business district to a connection with the existing pavement south of the town.



The elimination of two bad turns, one a right angle, was made possible by the securing of new rights of way, which were furnished by the municipality.

In the business district, the city of Cloverdale, using the District Improvement Act, has placed an additional width of pavement, providing a completed pavement approximately 56 feet in width. The center 20 feet was paved by the state.

The improvement completes a continuous pavement from the San Francisco ferry at Sausalito to the north city limits of Cloverdale, including the distances through cities.

The Cloverdale improvement was made possible by the cooperation of the municipality. Division IV had charge of the project.

WHAT ARIZONA FARMERS THINK OF THEIR PAVED HIGHWAYS.

Maricopa county, Arizona, with 20,000 motor vehicles, has paved 330 miles of road in a three-year period. The *Farm Journal*, Philadelphia, estimates that these roads save car owners $1,560,000 a year, on a basis of 3000 miles travel per car per year and an average saving of 2.6 cents a mile in operating costs, as compared with the dirt roads they formerly had. An additional saving of $160,000 in transporting farm produce brings the total to $1,720,000 a year. Bond issues totaling $8,500,000 were used in financing the road program. The annual interest, sinking fund and maintenance total $646,000 a year, making the annual net earnings more than $1,000,000.

The *Farm Journal* sent letters to the rural residents of the county, asking if the roads saved money for them, and whether they would vote for bonds if the question came up again. Replies were received from 144, of which 137 were wholly favorable, three did not believe the roads saved enough to pay the cost, two said the roads did not save anything, one said the roads were profitable but he would not vote for them again, and one, having no machine, said he did not know.

Increased farm land values, longer life of machines, saving in gasoline, tires and repairs, were among the benefits mentioned. Others said the comfort and satisfaction of riding on good roads were worth the whole cost.

DIVISION VII ENGINEERS PERFECT DEVICE TO SUPPORT REINFORCING STEEL IN CONCRETE PAVEMENTS

A DEVICE which appears superior to any method yet proposed for properly supporting reinforcing steel in the construction of cement concrete pavements has been perfected by two engineers of Division VII, it is reported by S. V. Cortelyou, division engineer, in a letter to the Construction Department. It consists of a bar into which are fitted adjustable hooks that hold the reinforcement in correct position during placing of concrete. The bar when in use rests across the header boards, as shown in the accompanying illustration and sketch.

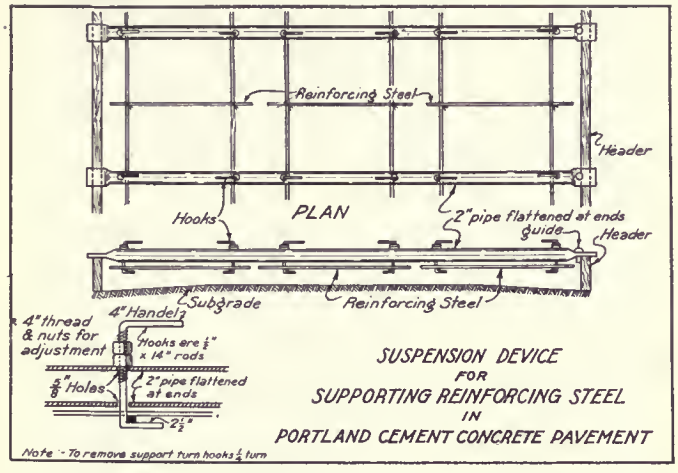
To hold mesh or bar reinforcing in place so that it will have a proper position in the concrete slab has ever been a problem in the construction of pavements. Formerly reinforcing was held up by a small pile of concrete mix placed on the subgrade, but the steel had to be adjusted from time to time as placing of the mix progressed. With constant watchfulness this method gave fair results, but was far from satisfactory.

Another plan sometimes followed was to place small blocks of concrete or rocks on the subgrade to hold the reinforcing. This method was never satisfactory and has long been discontinued. Still another method was the use of a sled dragged on the subgrade behind the mixer. The sled often gave better results than other methods but had many objectionable features.

A more recent plan is the use of especially manufactured steel pins or chairs. (Such pins have been specified for use on the Debo cut-off project near Oxnard, where they will be tried for the first time in Division VII.) Pins or chairs, however, can not be used on second-story concrete since the pins can not be driven into the old base and chairs must be held against slipping.

Tests Prove Advantage.

The plan of the bar and hooks, as worked out by Resident Engineer W. D. Eaton and Assistant Resident Engineer Walter



T. Lamb on the Jahn and Bressi contract in San Diego County (M-93 VII-S.D.-2-C&D), seems to have many advantages over any of the above methods. By it, the reinforcing steel may be placed in correct position and held there. Numerous tests of the position of the steel after tamping of the fresh concrete demonstrate this to be a fact.

The device is left in position until the concrete is spread and is removed just ahead of the tamper. The hooks are adjustable and can be changed for different thicknesses of pavement, while the drilling can be varied to suit any type of reinforcement.

The division believes the success of the device is assured. It is positive in the placing of the reinforcement, costs little, and is simple in operation.

THROUGH HILLSBOROUGH—Widened Peninsula state highway, San Mateo County, where it borders on one side municipality of Hillsborough and on the other side city of San Mateo. A cement concrete shoulder and additional asphaltic surfacing provide a forty-foot street. (Div. IV photo.)

ANOTHER improvement on the Peninsula highway which will facilitate traffic through cities of Hillsborough and San Mateo has been completed by Division IV, working in cooperation with the city of San Mateo. (Contract M-137, IV S.M.2-B.) The work done consisted of the placing of an 8-foot concrete shoulder on the west side of the existing 24-foot pavement and the placing of an asphalt concrete surface over the old asphalt surface.

A similar improvement was made on the east side of the highway by the city of San Mateo, which financed an 8-foot concrete shoulder with a curb and gutter to match the work done by the state.

The completed roadway, including the work done by the city of San Mateo, provides a 40-foot pavement through the Hillsborough-San Mateo section. Similar widening has been done by the state on other sections of the Peninsula route through San Mateo County. The work was done by the Municipal Improvement Company.

ASSOCIATION HONORS MR. TOY

The American Association of State Highway Officials at its recent convention, held at Pinehurst, North Carolina, reelected Chairman Harvey M. Toy of the California Highway Commission a member of its Board of Directors. This action was taken despite the fact that Chairman Toy was unable to be present and is a recognition of his services in furthering the cause of federal aid throughout the West.

ANOTHER DIVISION VII INVENTION IN USE—Device perfected by resident engineers to hold cement concrete pavement reinforcement in position during placing of mix.

ROAD CONGRESS PUBLISHES REPORT OF C. S. POPE

THE permanent International Association of Road Congresses, which this year held its fifth meeting at Milan, Italy, has issued in printed form the report on bituminous and asphaltic roads prepared for the congress by Charles Stockton Pope, M. Am. Soc. C. E., Construction Engineer for the California Highway Commission. Mr. Pope was chosen as chief reporter for the United States on asphaltic roads.

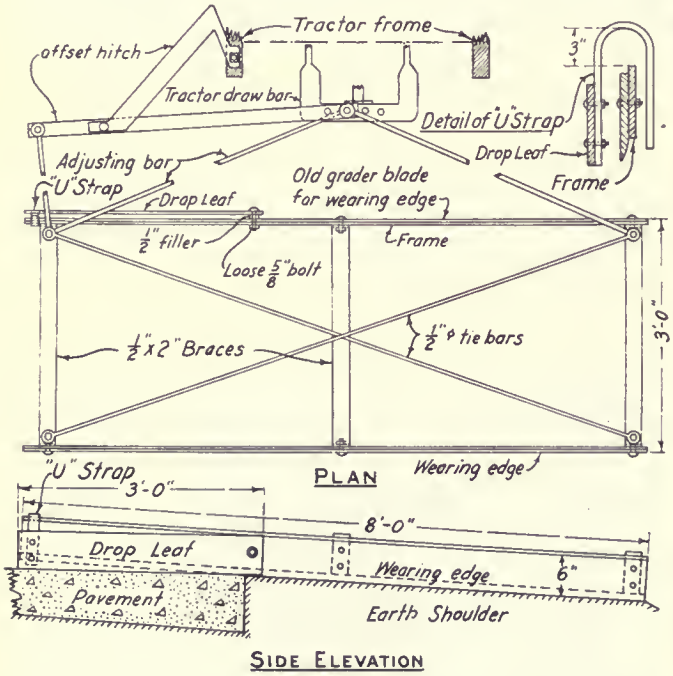
After defining the various types of road included within the designation "bituminous and asphaltic," Mr. Pope's discussion includes a presentation of the subject under the following headings: Classification by Construction Methods, Advance in Practice; Binder Distributors, Mixer Plants, Bituminous Binders, Properties, Identification Tests, Classification Tests, Differentiation Tests, Aggregates, Wear and Impact Tests, Cementation Tests, Asphalt Sands and Mixed Pavement.

The collaborators who assisted Mr. Pope and whose papers on details of the subject are also quoted at some length in the published report are: Christian P. Jensen, County Surveyor, Fresno, California; Philip P. Sharples, Consulting Highway Engineer, Redondo Beach, California; Henry G. Shirley, Chairman, State Highway Commission, Richmond, Virginia; and Francis P. Smith, Consulting Highway Engineer, New York City.

DIVISION II HAS PLAN FOR DROP-LEAF SHOULDER DRAG

THE necessity for a return trip when grading shoulders to throw excess material back and to clean the pavement has been obviated by a new drop-leaf shoulder drag developed by Division II, a plan for which is shown herewith.

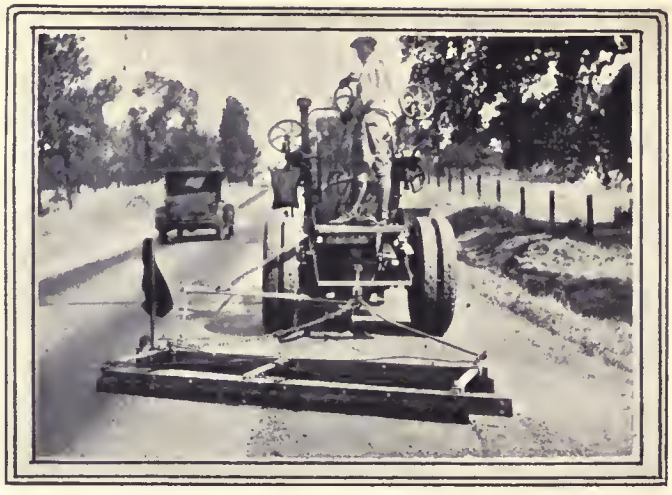
The drag is used behind a one-man grader and is set to throw the material away from the road. It takes the excess material



SIDE ELEVATION

thrown up by the grader and smooths it over the shoulders. The drag, the division reports, makes the usual extra trip unnecessary and saves about a third of the expense of grading shoulders.

The outfit was designed by Maintenance Superintendent E. L. Stump and was built from old grader blades and scrap iron at a cost of about $12.



Drag in use in Division II for shaping of shoulders.

EFFECTIVE ASPHALT PATCHER.

THE conical-shaped asphalt pouring pot shown in the accompanying illustration has been found to be a very convenient piece of equipment, reports the Maintenance Department. It is in use in several of the divisions for filling pavement cracks with hot asphalt.

A three-eighths-inch rod for regulating the flow of the asphalt extends through the center of the cone to the outlet at the point. This is done by raising or lowering the rod by means of the latch shown at the base of the wooden handle.

The capacity of the container is one gallon. The pot here shown was made up in the Headquarters Shop from a plan furnished by Division III.

BROKEN CUT SLOPES SAVE GRADING QUANTITIES

THE use of broken cut slopes to save grading quantities and possibly avoid slides is being put into practice in Division I, on some of its grading contracts. The view shown herewith is on Route 15, west of Wilbur Springs, now being graded by prison labor.

The difference in character of soil as shown by the first shovel-cut indicated that, while the top half of the cut would require a slope of 1 to 1 to prevent slides, the lower left of the cut could be taken out on slopes of ½ to ¾ to 1 with safety.

The application of this principle was the means of saving many yards of excavation in this one cut.

BROKEN SLOPES—View on convict job in Lake County, Division I, showing (on right of cut) broken slope which saved grading quantities.

BIDDING FOR THE TOURIST

ONE OF the projects of the California Highway Commission in making the highways of the state better, safer and more attractive, is the construction of a high arch bridge over Dog Creek Canyon, on the Pacific highway, in the Sacramento mountains. In making this and other great improvements in the route through these mountains, the prime purpose is to facilitate travel into California from the north by this chief artery of motor travel of the Pacific Coast. In order to do this many miles of this highway have been regraded and finely graveled, other miles paved, and it is the purpose of the commission to pave it all as rapidly as funds for that purpose may be secured. All of that highway from San Diego to British Columbia, passing through three states and one province, is paved except these few miles in the Sacramento mountains.

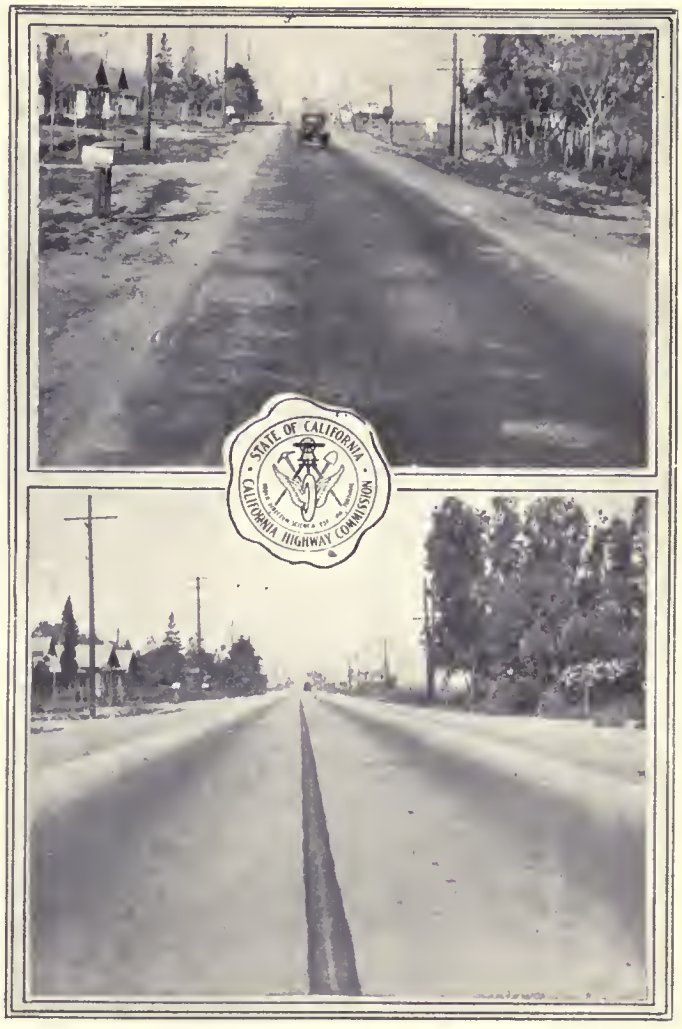
When this work shall have been fully done, the Pacific Coast will possess the longest continuously paved highway in the world, along whose length greater and more numerous scenic wonders and attractions exist than along any other touring route on earth. That is something worth striving for. It would bring into California an increased number of tourists and add to the already huge sum of money expended by motorists as they wheel over our highway system.

The time is soon coming, when motorists will consider the opportunity to wheel over this great Pacific highway, from Mexico, through California, Oregon, Washington and British Columbia, as their chief inducement for crossing the continent. The commission is showing great financial wisdom in bringing to perfection as speedily as possible this great backbone of Pacific Coast travel.—*Turlock Journal.*

To Repel Invaders.

The following sign is displayed above the ice-cream counter of a prominent drug store:

"Take a brick home; it's fine when company comes."—Union Pacific Magazine.



BEFORE AND AFTER, DIVISION VIII—*Above*, old patched pavement near Redlands. *Below*, same location, new 20-foot "second story" concrete pavement recently completed. (Photos by Div. VIII.)

GOOD JUDGMENT USED

(Santa Ana *Register.*)

WITHIN three or four months, the fine new bridge on West Chapman street across the Santa Ana River will be completed and in use.

It will be a bridge that will accommodate traffic for many years to come. It was with a view to the future that a decision was reached by the State Highway Commission and its engineers to dismantle the old bridge and rebuild a broad structure, adequate to the demand of traffic. Any effort to have used the old bridge would have resulted in two contingencies, one the leaving of a wall down the center of the bridge, which would be an ever-present menace to life and property, the other the placing of the bridge far off center.

Since the cost of the new bridge, as it is being built, was only some $10,000 or $12,000 greater than would have been the cost of building an addition to the old bridge along its south side, it seems to us that the State Highway Commission would have been short-sighted indeed had it decided in favor of letting the old bridge stand.

Incidentally, we might remark that, after the bridge is built, the next big job on hand will be to keep the river under the bridge.

WHAT THE DIVISIONS ARE DOING

BEAUTIFICATION AT WILLITS OFFICE—Views show office and grounds of Division I as they were a few years ago and today. Planting of grass, shrubs and flowers was done by T. H. Taylor in addition to his regular duties of janitor and testify to his energy and interest.

DIVISION IV.

HEADQUARTERS, SAN FRANCISCO.

JOHN H. SKEGGS, DIVISION ENGINEER.

Counties of San Francisco, Marin, Sonoma, Napa, Contra Costa, Alameda, Santa Clara, Santa Cruz, and San Mateo.

THE Pacific States Construction Company of San Francisco has completed the rough grading, including the installation of pipe culverts, on its Contract (M-144, IV Mrn.L-B), for straightening and widening the existing highway through the cities of Ross and Larkspur, Marin County, a section of the Redwood highway. Contractors are now busily engaged in making subgrade for the new pavement.

Tieslau Brothers, contractors, have started work on their contract (M-149, IV C.C.-14-B), for the grading and straightening of the state highway in Contra Costa County from El Ciervo to Valona. This work will involve heavy yardage and extensive remedial work in the vicinity of Valona slide, which has given the commission considerable trouble in the past in maintaining an existing road over the sliding area.

"Bottleneck" Work Starts.

The Kaiser Paving Company, contractor, has commenced work of widening and straightening that section of the Peninsula highway known as the "Bottleneck" extending from Colma to Cypress Lawn Cemetery, in San Mateo County. It is contract M-148. The contractor's forces have been at work for several weeks clearing the right of way through Woodlawn and Greenlawn cemeteries.

The work will consist of constructing a graded roadway on each side of the center of the new right of way. The central 28 feet will be occupied by the double track of the San Mateo line of the Market Street Railway. The typical cross section provides for a central 28 feet for car tracks with a 40-foot roadway on either side thereof, together with 8-foot sidewalks, making a total width of 124 feet. A paving contract is expected to follow the grading.

DIVISION VI.

HEADQUARTERS, FRESNO.

E. E. WALLACE, ACTING DIVISION ENGINEER.

Counties of Fresno, Madera, Merced, Mariposa, Kings, Tulare, and Kern, north of the Tehachapi.

THE California Road and Street Improvement Company has completed its contract for widening and resurfacing with asphaltic concrete a short section of state highway south of Fresno, between Church avenue and Cherry avenue. A full width street has been provided in cooperation with the city of Fresno.

Chester A. Failing was awarded the contract for graveling between Mormon Bar, through the town of Mariposa, to the

Asphalt pavement planer in operation near Bakersfield, Division VI. It deposits removed material at edge of concrete shoulder to form solid border.

first crossing of Bear Creek, on the Yosemite lateral. The work will greatly improve this route for winter travel. Rock is being crushed at the dump of the famous old Mariposa Mine, near the town of Mariposa.

The new division office building at Fresno will be completed about November 15th. Division VI expects to move into the new headquarters shortly after that date.

DIVISION VII.

HEADQUARTERS, LOS ANGELES.

S. V. CORTELYOU, DIVISION ENGINEER.

Counties of Los Angeles, Ventura, Orange, San Diego, and eastern Kern, south of Mojave.

CONSTRUCTION of the Oxnard-Hueneme road cut-off is progressing rapidly. This 5-mile section of new highway will connect Oxnard with the highway down the coast; the connection is to be made in the vicinity of Point Mugu. Culvert construction and grading is in progress and preparations are being made for placing concrete pavement.

Along the coast westerly from Ventura and extending to Sea Cliff, a distance of 8.4 miles, the width of the roadway grade will be increased and the pavement double-decked and widened with cement concrete. The contractor, J. F. Knapp, of Stockton, is on the job and has commenced work. Otto Parlier has subcontracted the construction of seawalls, about 1500 lineal feet, a part of the reconstruction program covered by the contract.

From the easterly city limits of Santa Ana and on through Tustin, 1.6 miles, the Griffith Company of Los Angeles has been awarded a reconstruction contract for the building of a 56-foot cement concrete pavement with gutters and curbs. A local improvement district is cooperating and the work is well under way.

A 15-mile pipe line has been laid from Jacumba to the foot of Mountain Springs grade by Jahn and Bressi, contractors, to furnish water for the construction of the 20-foot cement concrete pavement on Mountain Springs grade, San Diego and Imperial counties. Grading and culvert construction is in progress.

DIVISION X.

HEADQUARTERS, SACRAMENTO.

R. E. PIERCE, ACTING DIVISION ENGINEER.

Counties of Amador, Calaveras, Alpine, Tuolumne, Stanislaus, San Joaquin, Solano, and southern Sacramento and Yolo counties.

TWO sharp reverse curves, one just south of Ceres, the other north of Keyes in Stanislaus County, have been replaced by long, easy curves. The work was done by the Valley Paving and Construction Company, using asphaltic concrete pavement with crushed gravel subgrade and borders.

C. L. Caine, foreman in charge of maintenance in Solano County, is performing exceptionally good work in widening the roadbed and patching broken sections of concrete pavement. Some patches which are being placed can hardly be termed "patches," inasmuch as, in some places, broken pavement has been replaced in strips as long as 150 to 200 feet, varying in width from one-half to the full width of the pavement. All the patch work is being done by placing asphaltic macadam under general maintenance allotments.

Improving Pioneer Roads.

Under D. M. No. 186, H. S. Clark, maintenance foreman, is constructing a new section of road on the Mother Lode route which will eliminate two bad creek crossings between Plymouth and the Cosumnes River in Amador County. Upon the completion of this work, the Mother Lode highway between Jackson and El Dorado will be made an all-year road.

STONE FINISH BRIDGE—Reinforced concrete bridge with exterior finish of natural stone completed on Merced canyon entrance to Yosemite Valley. Three such bridges have been built on this section. (Bridge Department photo.)

Maintenance forces under the supervision of Superintendent H. L. Montfort are doing widening work at several points along Priests Grade. (X, Tul-40-B.) With the completion of this work, this road will be made much safer for travel to Yosemite National Park via the Big Oak Flat.

W. H. Martin, superintendent in charge of maintenance in San Joaquin County, has recently completed the construction of gravel shoulders for 0.7 of a mile east of Tracy. (X. S. J.-5-A.)

WHO COULD IT BE?

"Stop!" cried the voice in the taxi.

The driver stopped.

"I don't mean you. Keep right on driving," said the voice.

BRIDGE DEPARTMENT NEWS

J. A. MOHR and Son, contractors, have completed the cleaning and painting of the steel bridge across the Russian River near Healdsburg, Sonoma County, on the Redwood highway. The work consisted of cleaning the two steel spans and placing a primer and finishing coat of paint, the finished coat being sanded to a point about 5 feet above the sidewalk grade.

McDonald and Maggoria, contractors, are making satisfactory progress under their contract (M-135, IV Mrn. 1-B), for the widening of an earth fill concrete arch across San Anselmo Creek in the city of Ross, Marin County. The arch ring is completed and the contractors are at present completing the sidewalk on the east side, which is cantilever from the spandral wall. Forms are now being constructed for placing the sidewalk on the west side of the old structure. The sidewalk is being constructed to conform to the new curve laid out over the existing structure.

BEFORE AND AFTER—Views at San Pablo Creek on state highway leading from Martinez to Oakland. New structure provides ample width, improved alignment, and safety walks for pedestrians. A reconstruction job. (Bridge Department photo.)

On the Los Angeles to San Diego route good progress is being made on the new reinforced concrete girder bridge across Santa Ana River, two miles north of Santa Ana.

HIGHWAY NEWS NOTES

Chairman and Mrs. Harvey M. Toy of San Francisco have announced the engagement of their daughter, Miss Elizabeth Toy, to Mr. Arthur Lewis Schwartz of Cleveland, Ohio.

E. C. Pohl and H. D. Mills, of the Nevada state highway department, visited Sacramento recently for the purpose of making a study of the accounting department of the California Highway Commission. They were particularly interested in the rental system of accounting in operation in the Equipment Department.

Division Engineer E. E. Wallace of Fresno reports the arrival of a daughter, Janet Marie, on November 16th.

EXCUSED.

Jimmie carried the following excuse to the teacher the next morning: "Please excuse Jimmie from being absent. He had a new baby brother. It was not his fault.—*Emory Toreador.*

STATE HIGHWAY FUND CONTRACTS (Bond Funds, Including Federal Aid)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE OCT. 12, 1926.						
463	VII	Los Angeles	60	A	Arroyo Sequit to Las Flores Canyon	16.13	Grading	S. Wright Jewett	$306,300 00	Feb. 13, 1925	------
487	VII	Los Angeles	60	A	Latigo Creek to Las Flores Canyon	6.70	6.3 mi. P.C.C. Pave., 0.4 mi. Bit. Mac.	Ed. Johnson and Sons	241,904 25	Nov. 13, 1925	------
499	III	Placer	3	A	Across Auburn Ravine at Lincoln	------	Concrete Girder Bridge	Holdener Const. Co.	17,618 18	May 15, 1926	------
500	II	Lassen	28	A	Between 4 miles W. of Bieber and Bieber	3.80	Grading and Screened Gravel Surf.	John F. Collins	74,608 02	May 27, 1926	------
					AWARDED SINCE OCTOBER 12, 1926.						
516	V	Santa Barbara	2	E	Across Gaviota Creek	------	Concrete Girder Bridge	Oberg Bros.	$23,411 25	Nov. 16, 1926	175
					Sub-total	------			$23,411 25		
					PENDING AWARD—None.						
					Total State Highway Fund Contracts Awarded and Pending Award	------			$23,411 25		

NOTE.—Primary construction covered by the above contracts does not include funds obligated on cooperative forest highway projects, prison camp road activities, or day labor jobs not being done under contract.

STATE HIGHWAY MAINTENANCE FUND CONTRACTS (Including Gasoline Tax Fund)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE OCT. 12, 1926.						
M-110	VII	Los Angeles	4	B, C	Castaic School to Half Way Inn	22.00	Bituminous Macadam Surface	Fred Nighbert	$196,186 61	Dec. 14, 1925	------
M-117	IV	Contra Costa	14	A	Across San Pablo Creek at San Pablo	------	Concrete Girder Bridge	R. B. McKenzie	23,231 25	April 23, 1926	------
M-131	II	Modoc	28	C	Between Alturas and Royce Ranch	10.84	Grading and Crushed Rock Surfacing	J. P. Holland, Inc.	66,883 50	June 8, 1926	------
M-137	IV	San Mateo	2	B	Through the town of Hillsborough	0.23	P.C.C. Pave. Wid. and Asph. Conc. Surf.	Municipal Imp. Co.	8,430 41	Aug. 16, 1926	------
					AWARDED SINCE OCTOBER 12, 1926.						
DM-184	VI	Mariposa	18	C-D	Morman Bar Road to First Crossing Bear Creek	9.05	Surfacing existing roadway	Chester A. Failing	$26,550 00	Nov. 16, 1926	220
M-152	VII	Orange	60	A	Across Santa Ana River	------	Clean and Paint Bridge	Natl. Sand Blast Corp.	2,328 75	Oct. 22, 1926	75
M-153	IV	Marin-Sonoma	8	A	Petaluma Creek Basoule Bridge	------	2 Pile Fenders and 4 Pile Dolphins	Healy-Tibbitts Const. Co.	11,857 50	Oct. 22, 1926	60
M-154	V	Santa Barbara	2	G	At the Ellwood Overhead Crossing	0.30	Grading and Rock Surfacing	E. Schelling	20,466 00	Oct. 29, 1926	100
M-155	VII	Los Angeles-Ventura	2	C-B	Between Calahasas and Camarillo	------	Widening and Repairing 4 Bridges	Henry Auerbach	23,989 78	Oct. 29, 1926	150
M-156	VII	San Diego	2	C	Across Las Flores Creek	------	Concrete Girder Bridge	Sidney Smith	28,372 50	Oct. 29, 1926	150
M-157	VII	Los Angeles	9	E	Across Eaton Canyon Wash	------	Concrete Girder Bridge	Sidney Smith	36,499 50	Oct. 29, 1926	100
					Sub-total	9.35			$150,064 03		
					PENDING AWARD—None.						
					Total State Highway Maintenance Fund Contracts Awarded and Pending Award	9.35			$150,064 03		

NOTE.—The above obligations charged against the State Highway Maintenance Funds do not include funds from these sources obligated for general maintenance and for specific betterments being done under day labor authorization.

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CALIFORNIA HIGHWAYS

A BULLETIN ISSUED BY THE CALIFORNIA HIGHWAY COMMISSION FOR THE INFORMATION OF ITS EMPLOYEES AND THE PUBLIC

Vol. 3 DECEMBER, 1926 No. 12

In this issue: **Biennial Report Tells of Progress on State Highway System.**

CALIFORNIA HIGHWAYS

This Bulletin is published by the California Highway Commission for the information of its employees and the public. Editors of newspapers and others interested are welcome to use, without restriction, any of the matter herein contained. Cuts will be gladly loaned upon request.

FRANK B. DURKEE - - - Editor
P. O. Box 1103, Sacramento, California.

Vol. 3. DECEMBER, 1926. No. 12

CALIFORNIA HIGHWAY DEPARTMENT

FRIEND WM. RICHARDSON, Governor.

CALIFORNIA HIGHWAY COMMISSION

HARVEY M. TOY, Chairman, San Francisco

N. T. EDWARDS, Commissioner, Orange

LOUIS EVERDING, Commissioner, Arcata

R. M. MORTON, State Highway Engineer, Sacramento

PAUL F. FRATESSA, Attorney, San Francisco

W. F. MIXON, Secretary, Woodland

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L. V. CAMPBELL, Office Engineer

FRED J. GRUMM, Engineer of Surveys and Plans

Bridge Engineer

C. S. POPE, Construction Engineer

R. H. STALNAKER, Equipment Engineer

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C. L. McKESSON, Materials and Research Engineer

BEN H. MILLIKEN, Superintendent of Prison Road Camps

HERMAN B. WEAVER, Chief Accountant

LOWELL R. SMITH, Purchasing Agent

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H. S. COMLY, Division II, Redding

F. W. HASELWOOD, Division III, Sacramento

J. H. SKEGGS, Division IV, San Francisco

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F. G. SOMNER, Division IX, Bishop

R. E. PIERCE (Acting), Division X, Sacramento

General Headquarters, Third Floor, Strub Bldg., Eleventh and P Streets, Sacramento, California.

THE CHRISTMAS SPIRIT AND GOOD ROADS.

The season of Good Cheer—that gladsome time when we discard the artificial and feel and act as human beings should toward one another—is once more at hand. It is the spirit of Christmas that for countless generations has been spreading slowly over the earth, building the foundations of a better civilization.

Transportation ever has been its helper as the Ideals of Good Will of nearly twenty centuries ago have been carried onward across new frontiers to the ends of the earth.

This is the season when Ignorance, Hate, Prejudice, Provincialism are forced into the background by the warm glow of the light of our better selves. The spirit of Christmas for a brief time, at least, dominates over its age-old antagonists. They were the enemies of the Great Teacher even as they are still the forces that thwart progress in our day.

Nothing has been of greater force through the ages in breaking down these barriers than improved means of transportation. And, today, transportation for the great mass of the people is interpreted in terms of better highways. So, when we build good roads, we are not merely earning our daily bread, we are providing means for a more widespread advance of the Spirit of Good Will.

This is an opportunity of service that comes to those who serve all the People in a worthy effort. Let us appreciate it and resolve to be honest and efficient; to make the Highway Department the outstanding service which the government of California renders its citizens; let us carry the spirit of Christmas through the year.

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Engineer's Invention May Change Cross-sectioning Methods ----------page 12

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EVERY employee of the highway commission has a direct interest in the improvement of the highway organization's methods and results, both engineering and clerical, office and field. To that end, the State Highway Engineer invites constructive criticism or suggestions from every employee.

Ideas as to the more economical and efficient handling of your job, or suggestions for elimination of waste will be welcomed. Criticism is also desired from persons outside the organization, who are in a position to give facts.

Send only signed communications addressed as follows: California Highways, P. O. Box 1103, Sacramento, Cal.

DECEMBER 1926

California Highways

VOL. 3 No. 12

Commission and Engineer Submit Biennial Reports

EXPERIENCE OF RECENT YEARS CRYSTALLIZED IN RECOMMENDATIONS

RECORDING the accomplishments of the last two years in the administration of the State highway system, the California Highway Commission and State Highway Engineer have filed with the Governor, as required by law, their reports for the biennium ending June 30, 1926. The reports with the various appendices cover in thorough detail the work and investigations of the department. The experience of recent years, during which important changes have been made in highway procedure and standards of construction, have been crystallized in recommendations for needed legislation and future policies. The reports are as follows:

REPORT OF CALIFORNIA HIGHWAY COMMISSION

CONSTRUCTION WORK, in comparison with past biennial periods, has been limited * * * on account of lack of new construction funds. The three bond issues had been previously expended except a balance of $3,000,000 and our only other available fund was federal aid, approximating $2,500,000 per annum.

New Construction.

In the matter of *new* construction, we have maintained a policy of confining the work to extensions of improvement on *interstate* and *main line* highways, to the greatest possible extent.

This report will show that quite material progress has been made in that direction. Marked improvement is noted in our records, and by the motorist, on the Redwood highway, the Pacific highway, the Truckee highway, the San Diego-Yuma highway, Needles to Barstow, Mecca to Blythe and the Coast route in the southern part of the state.

A project of considerable importance, undertaken during this biennium, is the Bay Shore highway from San Francisco to San Jose. The funds thus far expended, practically $500,000, have been supplied entirely by the city and county of San Francisco.

We regard the completion of the all-year road from Merced to the Yosemite Valley as of primary importance to the state. This project is an outstanding example of the effectiveness of convict labor.

Reconstruction.

Our program for reconstruction and maintenance has been aggressive.

In the *reconstruction* program, the recommendations of State Highway Engineer R. M. Morton have been based upon traffic congestion and condition of pavement, and we believe the best interests of the state as a whole have been conserved.

In conformity with the established policy, reconstruction work has been confined as nearly as possible to *main line* highways, such policy being justified by constantly increasing traffic. Reconstruction expenditures for the biennium, including overhead, total $10,956,888.18.

Maintenance.

Most satisfactory progress has been made in maintenance. Under authority of the law enacted by the 1925 legislature, the commission was enabled to take over for maintenance approximately 1200 additional miles of roads legally in the system but never having had

 (Continued on page 4.)

REPORT OF THE STATE HIGHWAY ENGINEER

THE biennial period from July 1, 1924, to June 30, 1926, has been characterized by steady and systematic progress in all phases of state highway activities.

New Laws.

An event of major importance was the enactment by the 1925 legislature of a measure sponsored by the Highway Commission, which clarified many situations of legal ambiguity in previous measures concerning the state highway work. Provisions which simplify the condemnation of land required for rights of way, and creating the Highway Commission's right to acquire additional parallel right of way for the preservation of timber were included in the new law. Another important feature makes it mandatory upon the part of the state, upon request of the trustees of any city having less than 2500 population, to take over and maintain connecting streets through the municipality.

Probably the most important feature of this act is the one under which the Highway Commission is directed to undertake maintenance on all traversable state highways, whether constructed or unconstructed.

Revenues and Expenditures.

The revenue from the gas tax and motor vehicle license measures, passed at the 1923 session of the legislature, has been sufficient to permit a healthy activity on the part of the highway organization. The details of revenues and expenditures for each fiscal year of this biennium are shown in the following table:

REVENUES JULY 1, 1924, TO JUNE 30, 1926—

	July 1, 1924, to June 30, 1925, amount	July 1, 1925, to June 30, 1926, amount	Total for biennium, amount
Bond issues	$3,181,500 00		$3,181,500 00
Motor vehicle license fees	3,079,658 26	$3,432,610 58	6,512,268 84
Gas tax apportionment	6,354,611 72	7,502,264 14	13,856,875 86
Federal aid	3,371,711 00	3,287,067 83	6,658,778 83
Contributions	495,935 09	375,733 09	871,668 18
Totals	$16,483,416 07	$14,597,675 64	$31,081,091 71

EXPENDITURES JULY 1, 1924, TO JUNE 30, 1926—

	July 1, 1924, to June 30, 1925	July 1, 1925, to June 30, 1926	Total for biennium
Overhead	$1,542,609 75	$1,409,928 40	$2,952,538 15
Maintenance	3,710,598 19	4,478,737 20	8,189,335 39
Reconstruction	4,008,045 32	5,789,430 23	9,797,475 55
New construction	6,518,622 68	4,367,133 51	10,885,756 19
Totals	$15,779,875 94	$16,045,229 34	$31,825,105 28

(Continued on page 7.)

STATE HIGHWAY COMMISSION MAKES RECOMMENDATIONS

(Continued from page 3.)

state service. A year's program of this additional service has resulted in a marked improvement in the traversable condition of these roads and has very considerably curtailed the pressure on the commission for more costly improvements.

System of Construction.

It has been the aim of the commission to establish a system of construction in accordance with the highest standards of engineering practice. Our research department has carried on investigations and compiled data which will have the effect of greatly prolonging the useful life of all types of pavement used by the state. The commission has a just pride in the beneficial results of the investigations of this department.

Convict Labor.

In our report of 1924 reference was made to convict labor. During the past biennium this labor has been employed in various localities.

The employment of convicts on state highway work is justifiable from every viewpoint. The cost of construction is at least no more than by contract and the state is relieved of the cost of maintaining a large number of men in prison, as they support themselves in camp. The state is also relieved in many instances of caring for minor children of prisoners, as the law provides that a portion of the convict's earnings shall be used for the support of dependents. One of the greatest benefits of the system is to the prisoner himself. It takes him away from prison environment and makes him self-supporting, thereby restoring his self-respect. At the end of his term it sends him out into the world hardened to toil, and with sufficient funds to support himself until he can place himself in some useful employment.

IN THIS CONNECTION WE RECOMMEND THE ENACTMENT OF A LAW PROVIDING AN ANNUAL APPROPRIATION FROM THE GENERAL FUND, NOT LESS THAN $1,800,000, FOR THE ENLARGEMENT OF PRISON LABOR OPERATIONS.

This amount is the estimate of the cost to maintain 1000 convicts on highway construction. Such an appropriation would really cost the state little, as a substantial saving in maintenance cost of state prisons would be effected.

An enlarged program of prison camp work will result in the mountainous and recreational areas being provided with adequate highways many years in advance of what would be possible without convict road building assistance.

Bridges and Grade Separations.

A problem of pressing importance is presented by the urgent need of construction of many major bridges on the highway system and the intolerable grade crossing situation.

The State Highway Engineer, after careful analysis, estimates that it will cost *fully* $15,000,000 to provide suitable bridge structures on the present highway system, of proper strength and width to care for the present and a reasonable increase in traffic. No such sum of money seems available during the period construction of these structures will become actual necessities, and some plan of finance, therefore, should be devised to meet the situation.

During the earlier period of highway construction it was the policy for counties to meet the cost of bridge construction, but with the present type of bridges, made necessary by expanded traffic, it has become an impossibility for most of the counties to finance their building. Considering the fact that many of the larger and more expensive bridges are located in counties of small assessable property valuation, our recommendation becomes the more important. At the present time there exists in one county alone a vital need for the construction of bridges which will cost $750,000, an amount far beyond the financial ability of the county in question.

Grade Separations.

Scores of lives are forfeited and hundreds of accidents are being recorded every year at grade crossings. The only remedy for this greatest hazard of motor vehicle transportation is in separating the highway and railway grades. The State Highway Engineer has estimated the cost, and reports that it will involve the sum of approximately $10,000,000 as the state's share. Here again, no fund seems available to meet the universal demand for this class of construction.

WE THEREFORE RECOMMEND A BOND ISSUE OF $25,000,000 TO BE MADE AVAILABLE OVER A PERIOD OF YEARS, AT AN ANNUAL RATE SUFFICIENT TO PERMIT RAPID PROGRESS IN CORRECTING THE EXISTING SITUATION, AS RELATES TO BRIDGE CONSTRUCTION AND GRADE SEPARATIONS.

Other states are faced with and meeting the problem of grade separations. New York recently passed a bond issue of $300,000,000 for the purpose. Of this sum $75,000,000 is allocated as the state's share. Of the remainder, the counties or localities and the railroads will be afforded long term loans on a division of $75,000,000 to the counties and $150,000,000 to the railroads.

A prison road camp in the mountains in Lake County, Tahoe-Ukiah State highway.

In connection herewith we refer to the report of the Highway Advisory Committee of 1925, in which is incorporated a like recommendation. This committee reported after a thorough investigation of the subject.

Protection of Highways.

We reaffirm our statement made in the 1924 biennial report that police protection be given the highways. Overloading of trucks and excess of speed is a menace to both life of persons and lasting quality of pavements. The law providing a state police should be adequately fortified to the end that officials can exercise their authority without personal loss as is now the case. An amendment to the law is recommended to make this possible.

Payments to Counties.

It has become apparent that a number of counties with little assessable property and small automobile registration are badly handicapped in providing funds for the care of county roads which connect with the state highway system.

In many instances these roads are used and worn out more by automobile owners from the centers of population in visiting recreational areas than by the residents of the counties.

Counties now participate with the state in an equal division of the motor vehicle license fees and gas tax receipts in proportion

to the number of automobiles registered in the county. In a few instances the amount so returned is nominal and can be used to little advantage for permanent improvement.

AFTER FULL CONSIDERATION OF THIS SUBJECT THE COMMISSION RECOMMENDS THAT THE LAW BE AMENDED TO PROVIDE THAT EACH COUNTY SHALL RECEIVE AT LEAST $15,000, THE REMAINING SUM SUBJECT TO DISTRIBUTION THEREAFTER BEING ALLOCATED ON THE PRESENT BASIS OF REGISTRATION OF AUTOMOBILES.

Such a change would cost the larger and richer counties very little and would be of material assistance to the smaller counties. The 1925 records disclose that nine counties would benefit and that only about $100,000 would be involved out of a total distribution of approximately $11,000,000.

Rio Vista Bridge.

This bridge, spanning the Sacramento River, was constructed

BRIDGE WHICH MUST BE REMOVED—Timber trestle across Sacramento River at Rio Vista which has been ordered replaced by the Federal government by permanent structure to facilitate dredging operations.

by the counties of Sacramento and Solano under permit and agreement with the United States War Department in March, 1917.

It was taken over by the state as part of the highway system by act of the legislature, as set forth in chapter 831 of the 1921 statutes. In the War Department permit for its construction is a clause as follows:

> "5. That if and when the river is widened by proper authority, such work may be done across the site of the bridge, without delaying the progress of such work to provide for bridge crossing or to give notice thereof, and that such extra spans as may be necessary to fill the portions of the bridge crossing and approaches as may be thus destroyed, shall be built by the permittees, their assigns or successors, without claim of any kind against the United States for compensation."

The federal government is now engaged in widening and deepening the Sacramento River at the point of the bridge location and has called upon the state, through the Highway Commission, as successors in interest, to construct additional and *permanent* spans to conform to their plans. This being part of a legislative act highway, there is no fund available from which the cost of construction can be paid.

In view of the fact that the progress of the federal flood control program is being interfered with and the further fact that our obligation is unquestioned, it is imperative that immediate action be taken on the federal request. It, therefore, appears to be a matter for which special appropriation should be provided, **and we recommend that an appropriation of $200,000 be made from the general fund of the state for this construction, that sum being the cost as estimated by the State Highway Engineer.**

CALIFORNIA HIGHWAY COMMISSION,
HARVEY M. TOY, Chairman.
LOUIS EVERDING.
NELSON T. EDWARDS.

RESULTS OF OILING BRING DEMAND FOR MORE

DURING the past summer experimental oiling of rock surfaced state highways was carried on in most of the divisions, under varying conditions of soil and climate from the deserts of Imperial County to the damp redwood sections of Humboldt County. The results generally were satisfactory and much was learned that will be of value when additional, similar work is undertaken.

In Division I, some 118 miles were treated. While the work was under way motorists frequently refused to heed the warn-

A section of oiled highway on Redwood route, Division I. The public is now demanding more improvements of this kind on this route.

ing signs or obey instructions of maintenance forces, with the result that there was considerable complaint from those who spattered their machines with oil.

Work Now Commended.

Now that the beneficial results are apparent to all, the division is being commended and many inquiries are being received as to when and where additional work will be undertaken. While the inconveniences of the past summer are hardly behind them, highway users are asking for more oiling, the division reports.

Plans for this type of work for 1927 are now being made. From the experiences of last year, it is believed a way can be found to do oiling in the future without motorists becoming besmeared and disgruntled.

The view shows a section of oiled highway near Ukiah, Medocino County. Dust is eliminated and a hard, smooth surface has been provided. Successful oiling may make paving of such roads unnecessary for many years.

HIGHWAYS AID PROGRESS OF NATION.

Good roads have not been given the credit due them as the advance agent of civilization and human progress. The church, the public school, the printing press, the home, all these have played a part, but have not improved methods of communication accomplished even more?

Good roads built the Roman Empire. They made possible the mobilization of the French armies on the border overnight when German invasion threatened in 1914. They have solidified the people of England and filled its colleges and universities. And now they are working a miracle in the United States.

Hard surfaced roads stretching from state to state and from ocean to ocean and border to border are welding the American people into a solid, coherent nation, abolishing provincialism and sectionalism, destroying dialects and spreading tolerance and understanding everywhere.—*Kentucky Highways.*

New Type of Surfacing to Lessen Skidding Used on Stanislaus Project

USE OF stone screenings as a finish for asphalt concrete surfacing was a feature of the Modesto-Stanislaus River reconstruction project (Stanislaus County, X–4–B), 7.8 miles of which has just been finished by the Valley Paving and Construction Company of Visalia. This is one of the first projects of any magnitude on which the new method of finishing, designed to prevent skidding, has been tried out. For this reason engineers of the department will watch with interest results on the Stanislaus job.

The original pavement was widened to 20 feet by cement concrete shoulders, 2.5 feet wide and 7 to 8 inches thick, placed on either side of the existing 15-foot base, which was surfaced with asphaltic concrete, averaging 2½ to 4 inches in thickness. Two-foot rock borders 4 inches in thickness, when compressed, also were placed along the concrete shoulders throughout the project.

Specifications for the finish read as follows:

> "Screenings for the surface finish shall be thoroughly coated with asphalt cement in the mixer and shall be applied to the surface immediately after the first rolling."

The screenings used were such as would pass through a ½-inch square screen with not less than 90 per cent of the total being

STANISLAUS PROJECT—View on recently completed widening project in Division X on which new nonskid finish for asphalt concrete surfacing is being tried out.

retained on a standard No. 10 screen. The amount applied averaged from 10 to 15 pounds per square yard.

The cement concrete shoulders were divided into 30-foot sections; expansion joints were filled with a bituminous composition and joined by steel dowels to prevent settling at the joints by action of traffic.

Traffic Hazards Removed.

Abrupt approaches to small bridges over irrigation canals, which long had been hazards to travel, were corrected by building long, vertical curves over these structures. Another important improvement was the elimination of several sharp curves at the approaches to Salida and at other points. These were replaced by long radius superelevated curves. Stanislaus County assisted the state by securing the additional right of way necessary to make the changes possible.

Grading was done as extra work, material being secured from borrow pits off the right of way and from the Southern Pacific Company, which permitted its right of way fence to be removed to facilitate the barrow for widening of shoulders.

All of the work on the main trunk highway under the contract of the Valley Company has been completed; and on November 30th, the company was relieved of further maintenance of this section, which was opened to traffic. The contract, however, has been extended to cover widening of about five miles of the Sonora lateral from Salida to the McHenry road. The present 12-foot concrete pavement on this section will be widened to 20 feet with asphalt concrete shoulders and surfacing. This part of the project is now under way.

Division Engineer R. E. Pierce of Division X is proud of what has been accomplished on the new Stanislaus County section, which completes a 20-foot pavement from Modesto northward to Turner Station, in San Joaquin County, a distance of about 20 miles.

The cost for 7.8 miles, which is classed as reconstruction, was approximately $163,500.

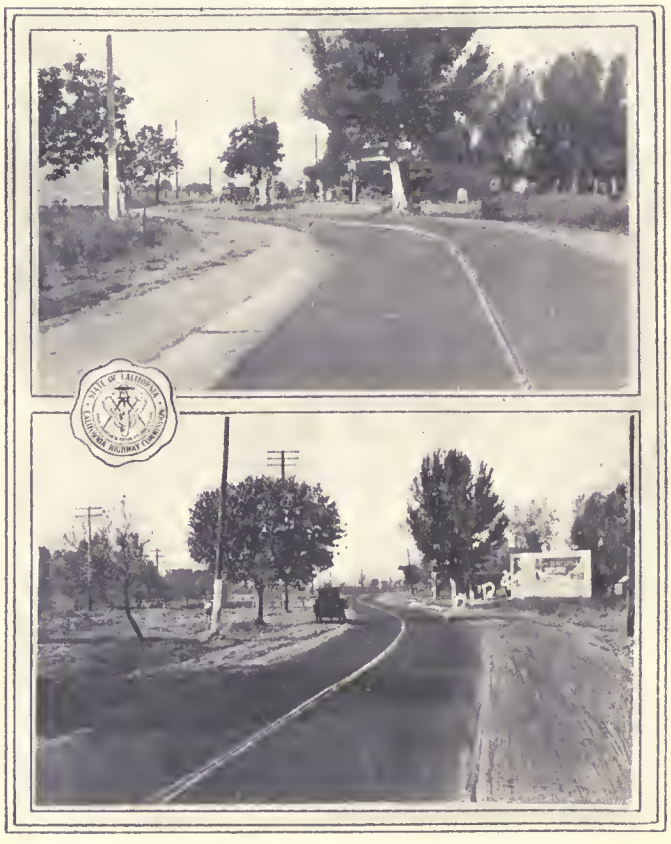
MALM COMPLETES REVISION OF ACCOUNTING SYSTEM.

A work of two years, during which he completely reorganized the accounting system of the California Highway Commission, has been finished by C. E. Malm, who has resumed his former position as assistant superintendent of accounts for the State Board of Control.

Malm was assigned to the task of studying and revising the accounting system of the department at the request of the highway commission. He began work on December 1, 1924.

In commenting on the reorganization, R. M. Morton, State Highway Engineer, said:

> "Mr. Malm's vision of the proper accounting system for our equipment department has resulted in a system which gives far more data and gives it quickly and accurately. We are proud of the department and challenge any organization to bring forth a better system."



CURVE IMPROVEMENT—*Above,* view of trunk highway near Keyes, Stanislaus County, Division X, as originally built. *Below,* same location with abrupt curves improved and superelevated. Similar line changes are being made at other points in San Joaquin Valley.

STATE HIGHWAY ENGINEER TELLS OF DEPARTMENT'S WORK

(Continued from page 3.)

Progress in Highway Construction.

Since July 1, 1924, the following mileages of highway, classified as to type, have been accepted by the Commission, including newly constructed highways and reconstructed highways:

HIGHWAYS CONSTRUCTED—

	New construction placed under contract prior to July 1, 1924, miles	July 1, 1924, to June 30, 1926, miles	Total miles
Graded or rock surfaced	230	95	325
Bituminous macadam	10	--	10
Portland cement concrete	18	15	33
Asphalt concrete on macadam or bituminous base	--	2	2
Total new construction	258	112	370
	Reconstruction		
Graded or rock surfaced	26	33	59
Bituminous surface	6	7	13
Portland cement concrete	58	38	96
Asphalt concrete on macadam or bituminous base	3	11	14
Asphalt concrete on Portland cement concrete	14	18	32
Portland cement concrete pavement widening	8	35	43
Total reconstruction	115	142	257
Total new construction and reconstruction	373	254	627

In addition to the above, there have been accepted by the commission 65 bridges and grade separation structures, 24 of which were placed under contract prior to July 1, 1924.

Highways Under Construction.

On June 30, 1926, the following mileage of highways was under contract and in progress of construction:

New construction	Miles
Grading or rock surfacing	*169.52
Bituminous macadam	6.21
Portland cement concrete	10.27
Asphalt concrete on macadam or bituminous base	6.45
Subtotal	192.45
Reconstruction	
Grading or rock surfacing	28.75
Bituminous macadam	9.64
Portland cement concrete	38.85
Asphalt concrete on macadam or bituminous base	6.11
Asphalt concrete surface on Portland cement concrete	28.00
Subtotal	111.35
Total under construction	303.80

*Includes 56.9 miles under construction by United States Bureau of Public Roads with Forest Highway funds.

Contract Prices Show Decline.

Prices paid for highway work have shown a decline during this biennium. Some of the reduction may be attributed, perhaps, to a standardization of specifications, contracts and plans. In so far as possible, in accordance with state law, it has been endeavored to closely define all details of requirements which might be subject to variation, and the result has been to render state highway contracts more popular with reputable contractors, thereby tending to reduce bids. Average contract prices during this biennium as compared with the preceding, are shown below:

AVERAGE CONTRACT PRICES, JUNE 30, 1921, TO JUNE 30, 1926—

Year	Grading (per cubic yard)	Asphalt concrete including all materials (per ton)	Concrete pavement including all materials (per cubic yard)
June 30, 1921, to June 30, 1922	$0 71	$7 92	$14 29
June 30, 1922, to June 30, 1923	0 74	8 10	13 18
June 30, 1923, to June 30, 1924	0 75	7 27	13 49
June 30, 1924, to June 30, 1925	0 59	6 43	10 85
June 30, 1925, to June 30, 1926	0 44	5 13	10 58

Overhead Expense.

Diligent and continuous effort has been exerted to accomplish a reduction of overhead expense in the highway work. Work on preliminary surveys has been curtailed to the minimum necessary to obtain proper data for preparation of plans. The machinery of preparing plans has been adjusted by standardizing details of the drafting work. Many contracts have been awarded on a basis of using preliminary estimates for final payment, thereby eliminating the expense of final surveys. Reports and other red tape of minor importance have been eliminated where possible, so that field men have more time to devote to their work.

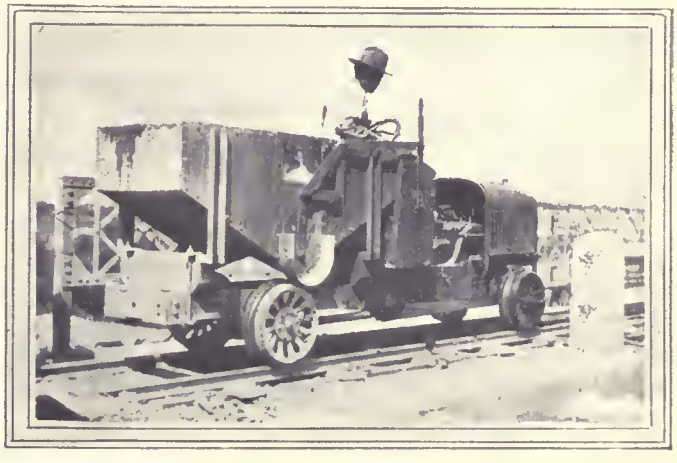
The number and size of day labor jobs authorized has been greatly reduced, and a practice has been inaugurated of taking informal bids in the locality for portions of day labor work susceptible of being done by contract.

Each department of our work is in charge of a *responsible* head, and close contact is maintained with the division engineers and field men. This tends to greater economy, both in overhead and in the construction expense.

Accounting System.

During this period the greater part of a study and modification of the accounting system was accomplished. This work was done at our request under the direction of the State Board of Control, which detailed one of its accountants to the work. A system has been devised, and on June 30, 1926, is ready for complete installation throughout all the offices, which has for its object the rapid accumulation of all accounting data soon after the last day of the current month.

The new system has as its basis the performing of the accounting work in the division offices, each functioning as a separate unit. The division reports are combined in the headquarters office to make up a monthly report for the operations of the entire organization.



Hopper for transporting concrete mix in use on southern California bridge construction. It is operated on an industrial railroad by a Ford engine. Speed is one of its advantages.

Highway Advisory Committee.

During this biennium the Highway Advisory Committee, the appointment of which was authorized by the 1923 legislature, performed the major part of its work. Mr. Louis Everding, member of the Highway Commission, and the writer, as State Highway Engineer, served on this committee throughout its existence.

The committee was given free access to the highway files, and, at its request, an estimate of the cost of completing the state highway system as it then existed was prepared by the highway organization. Care consistent with the purpose for which it was intended was given to its preparation. In the absence of surveys and plans, and, in some cases, even traversable roads which facilitated inspection, it is not considered that the estimate is close or final.

Many uncertain factors were immediately foreseen when the period of duration of highway construction was considered; therefore, the detail of this estimate for any particular highway may later be found inaccurate.

However, it is believed that this work of the highway organization for the committee has been instrumental in *bringing home to the people of the state a realization of the magnitude of the state highway project, and has impressed upon them the fact that its financing and orderly progress are matters of state-wide importance.*

Prison Road Camps.

During this biennium, thirty miles of highway have been graded through prison road camps. The outlay has been $1,882,900.

The transfer of state's prisoners from the confinement of the prison to the healthy atmosphere of the road camps is a branch of our work which is of inestimable benefit to the state as a whole.

When prison camps are organized, the Highway Commission, charged with the duty of expending state funds in the construction of highways, regards the road building activities of the camps as a major day labor operation of highway construction, and it becomes our duty to conduct the work economically so that the state will benefit by the accomplishment of construction at low cost in addition to the other benefits.

The economical performance of road work through these camps requires primarily that the work be in charge of superintendents and engineers of outstanding ability in the use of equipment and the handling of men. Large units of equipment are necessary on these jobs for the reason that no matter if men work only for their keep, they can not compete with modern earth-moving machinery in daily output. Rapid progress is necessary on work done by prison camps as well as by contract, particularly on primary roads.

Therefore, we find that our convict operations require not only man power, but also shovels, compressors, drills, pumps, trucks, etc.; materials and supplies such as powder and dynamite, drill steel and pipe; also, a considerable number of free men to act in supervisory capacities, as superintendents, foremen, time keepers, mechanics, truck drivers, and other skilled labor.

Analysis of the Briceburg job, where 17 miles of highway were graded between Briceburg and El Portal, and the Kern River job, where 8.3 miles of highway were graded westerly from Democrat Springs, is shown in the table below:

ANALYSIS OF BRICEBURG–EL PORTAL JOB.

		Per cent
Amount paid prisoners	$334,678 27	32.8
Amount paid free labor	196,692 00	19.3
Supplies and construction material	299,807 12	29.3
Equipment rental	189,873 99	18.6
Totals	$1,021,051 38	100.0

ANALYSIS OF KERN RIVER JOB.

		Per cent
Amount paid prisoners	$140,939 77	27.5
Amount paid free labor	134,733 83	26.3
Supplies and construction material	152,582 27	29.8
Equipment rental	84,254 49	16.4
Totals	$512,510 36	100.0

From the above figures, it can be seen that to accomplish the work expeditiously, *the prisoner expense is only a small part of the total.*

We consider that our efforts to perform this construction economically have been attended by a considerable degree of success. Reports on the final cost of these two jobs are set forth below:

BRICEBURG TO EL PORTAL.

VI–Mpa–18–E, F, G.

Item	Estimated cost	Actual cost
Excavation—unclassified, per cubic yard	$0 84	$0 904
Structure concrete, per cubic yard	35 00	43 43
Hauling and installing corrugated metal pipe culverts, per lineal foot	1 46	1 468

FIRST CROSSING KERN RIVER TO DEMOCRAT SPRINGS.

VI–Ker–57–G.

Item	Estimated cost	Actual cost
Excavation—unclassified, per cubic yard	$1 00	$1 004
Structure excavation, per cubic yard	3 00	2 67
Structure concrete, per cubic yard	35 00	57 50
Rubble masonry, per cubic yard	5 00	5 04
Riprap, per cubic yard	1 00	78
Hauling and installing corrugated metal pipe culverts, per lineal foot	1 76	1 273

The cost of performing the individual items of the work compares very favorably with prevailing contract prices for similar work. If prison road work can be conducted with costs as favorable as those shown above, it has justified its existence from an economical standpoint, in addition to the undisputed benefits to society.

Further analysis of the above figures shows that our cost of operating prison road camps is about $6 per prisoner per day, including all charges.

Location of Prison Camps.

Prison road camps can perform work most economically in remote locations in heavy mountainous territory where the opportunities to escape are reduced to a minimum, and where the work is sufficiently heavy to not require the frequent moving of camps. The present state highway system offers few locations meeting these requirements on main line roads. The state should concentrate all possible funds upon primary roads until they are completed.

In view of this situation, it would seem that *special* appropriations for convict camp operation should be authorized by the legislature, so that the number of prisoners, the locations selected for work, the size of the camps and all other details, will not need to be considered in connection with the other funds of the Highway Commission, all badly needed to complete main roads.

Our financial situation is such that for the next fiscal year not over 250 men can be financed in road camps. These will be located in three camps as at present: the Crescent City camp on the Crescent City-Grants Pass road in Del Norte County, the camp on Route 15, Tahoe-Ukiah road in Lake County, and a small camp on the Briceburg road in Mariposa County. This number will cost about $1,500 per day, or nearly $40,000 of cash outlay per month.

One thousand men in prison road camps, which number has been advocated by many interested agencies, would, at the same rate, cost the state $1,800,000 per year, and would probably result in completely grading 30 to 35 miles of highway per year.

Maintenance Stations.

During this biennium, the Maintenance Department has prepared a plan to be followed for the future location and equipping of maintenance stations. According to this plan, 112 stations are now owned, equipped and in use, and 111 additional stations will ultimately be required. It is our policy to gradually locate and acquire suitable sites, and construct the necessary facilities. During the past biennium, $476,818 have been devoted to this purpose from the State Highway Maintenance Fund. The cost, as at present estimated, for acquiring and equipping all the sites which will be ultimately required, is $694,400 additional.

Maintenance station at Crescent City, Del Norte County. The site was donated to the state by the county acting through the Board of Supervisors.

Well-equipped maintenance stations, including foreman's cottage, established at locations convenient to the road sections, result in more satisfactory work and higher-class personnel, with better care of equipment.

Division Offices.

During this period, division offices and shop buildings have been constructed or arranged for at Redding, Division II; Fresno, Division VI; and San Bernardino, Division VIII. At each of these locations areas of about three acres were obtained, providing ample room for present needs and for expansion.

Shop buildings only have been constructed or arranged for at Lankershim, Division VII, and at Bishop, Division IX.

The physical equipment and facilities for doing work of the Highway Commission have never been in better condition than they are at present.

Encroachments.

During this period, a study has been started, which, when completed, will be the basis of systematizing the issuing of permits for encroachments on the state highways. It is planned to establish ultimate widths of improvement on all of the state highways, to be used in the issuance of permits for the necessary encroachments, such as pole lines, water and gas mains, tree planting, sidewalks, etc. When this plan is finally perfected and in operation, the issuing of permits and the relations with those desiring to make encroachments will be greatly simplified.

Research.

Under the Construction Department, Mr. C. S. Pope, construction engineer, and Mr. C. L. McKesson, materials and research

engineer, have aggressively carried on the routine testing work attendant upon highway construction, and also important research work.

In 1924, in conjunction with the Lewis Institute of Chicago, extensive investigation of the use of calcium chloride for curing concrete was made at our laboratory. The results of this investigation have already been published by the Lewis Institute, due credit being given to the California Highway Commission.

In 1926, in conjunction with the U. S. Bureau of Public Roads, a systematic investigation of the loss of material on rock surfaced roads was undertaken, including methods of preventing this loss by the use of asphaltic binders. This investigation is still under way. The Bureau of Public Roads is furnishing a corps of its technical field men and laboratory experts as their share of the project.

Under the direction of the Construction Department, aided by laboratory studies, the strength obtained in our concrete mixtures has steadily increased. The field men have been furnished data which familiarizes them with the essential principles governing the mixing of concrete.

Advances have been made in the proportioning of asphaltic concrete mixtures to increase density, weight, and stability under traffic. Experimental sections have been constructed with surfaces roughened by uniform applications of premixed and heated small rock, designed to keep an open texture of the surface, thereby decreasing possibilities of automobiles skidding.

New Construction Funds.

The amount of $10,886,000, set forth in the beginning of this article, which has been expended for new construction during this biennium, checks closely with the receipts of federal aid from the United States government and proceeds from the sale of Third State Highway bonds during the same period.

SOUTH OF CARPINTERIA—Division V, reconstruction project; cement concrete shoulders and asphalt concrete wearing surface. New width 20 feet.

The vastness of the highway system of California prevents progress satisfactory to everyone being made with this amount in construction and extension of good road facilities. The demands of modern traffic are such that *makeshift* improvements, built at low cost, are entitled to scant consideration from an *economical* standpoint. Our past experience with traffic increases, both in number and weight, which has forced upon us a heavy outlay for straightening, widening and thickening our already built roads, makes it seem folly, in a state as wealthy as California, for the Highway Department to now enforce policies of *inadequate* road building. *Our improvements must be planned with both eyes on the future.*

Federal Aid.

It is believed that the United States government, in granting federal aid to this state, is interested primarily in the completion of the federal-aid highway system. The government has been most generous in permitting the state to collect federal aid on projects which are really reconstruction and widening of highways already classed as constructed.

It would be presumptuous for us to assume that this generous attitude will be maintained unless the people of the state provide money for that in which the government is primarily interested, namely, the extension and completion of the federal-aid highway system.

Ten million dollars per year is necessary to make a satisfactory showing of completed state highways, including the federal-aid system. We are unable to believe that the people of this state, who pride themselves on their good road system, are unwilling to authorize further state highway construction to this extent.

Respectfully,

R. M. MORTON,
State Highway Engineer.

COORDINATING TRANSPORTATION FACILITIES

By W. M. JARDINE, Secretary of Agriculture.

MOTOR vehicles—both automobiles and motor trucks—which, with the public highways, constitute the facilities of modern highway transportation, do not need to plead for their place in the sun. Not long since they could perhaps be passed over as nonessential—a fad, if you please. But not so now. The motor vehicles have given to highway transportation a new usefulness and the public has expressed its belief in them in the most powerful way it knows how—by the investment of billions of dollars of its capital in the more than 15,000,000 automobiles and more than 2,000,000 trucks.

Cooperation and coordination are the keys to the maximum usefulness of the new highway transportation. They are, in fact, the prerequisites of improvement in our whole transportation system—and they are needed all along the line. Road builders and vehicle manufacturers must cooperate in order that the roads shall be built to carry the vehicles and that the vehicles shall not overburden the road. The road building authorities of the nation, the states, the counties and the municipalities must cooperate that the roads which know no political borders shall be properly coordinated.

Railroad, waterway and highway transportation should be coordinated in order that each shall be developed to its highest point of usefulness without taking from another the functions which the other can perform to the better advantage of the public. Shippers and officials of transportation agencies must cooperate to eliminate unnecessary handling and reduce the time and cost of transportation. And finally we must develop a spirit of cooperation between the public and those who are working to improve transportation whether it be railway, waterway or highway transportation, to the end that the public needs will be met to the fullest possible degree and that a fair return upon the invested capital shall be assured to the agencies of transportation.

NEW STATE BUILDINGS AT FRESNO—*Left*, new office of Division VI which was recently occupied. *Right*, shop building, headquarters in the San Joaquin Valley of the Equipment Department.

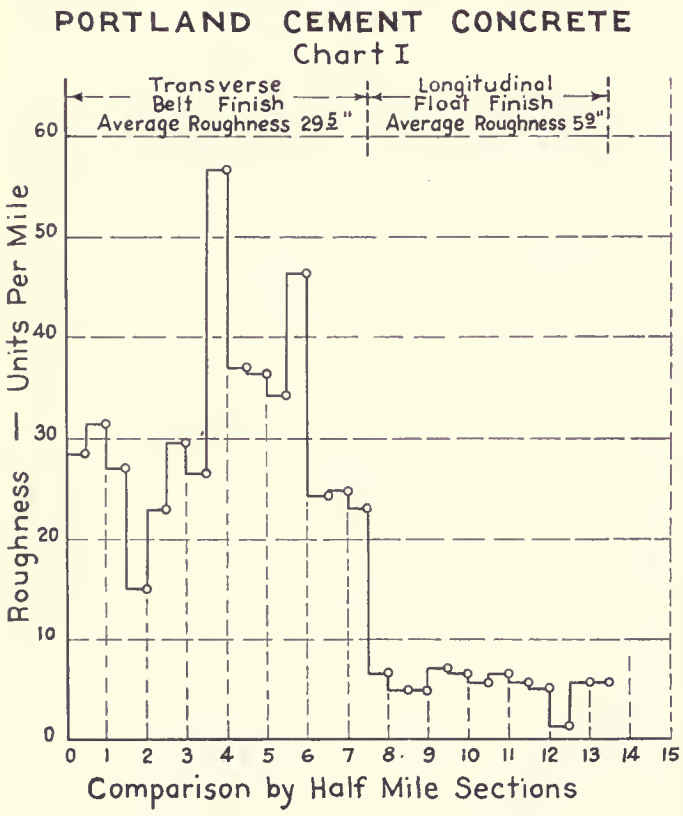
HOW USE OF VIALOG DURING CONSTRUCTION IS INFLUENCING SMOOTHNESS OF PAVEMENTS

By E. Withycombe, Assistant Engineer, Construction Department.

IN THE latter part of 1925 the Construction Department began using the vialog during the progress of indivdual paving projects, to give the resident engineer and the contractor current information as to the smoothness of surface to be expected on the complete job. In carrying out this program, an effort is made to reach each project to make a preliminary record, as soon as a section is opened to traffic. These preliminary tests are followed by subsequent vialog records made during later inspections for the purpose of comparison with the previous work.

The result has been to keep foremost in the mind of the resident engineer, the incentive to develop more effective methods of improving smoothness of pavements. In this effort, it is pleasing to note, they have had the hearty cooperation of contractors.

Several typical projects of both Portland cement concrete and asphaltic concrete, constructed within the last year, have been



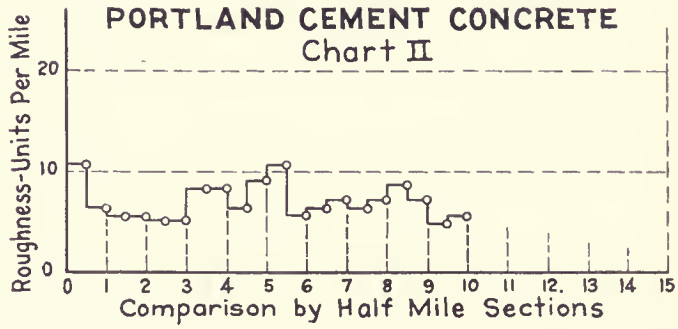
selected for preparation of charts showing roughness in each half-mile section from the beginning of construction to completion of the project. In each case, an improvement can be noted as the work progresses. A number of factors undoubtedly enter into this improvement but all are more or less influenced by comparisons brought out in the progressive vialog records.

What Charts Show.

Charts I and II of this compilation give the progressive record of two Portland cement concrete resurfacing projects; Charts III and IV are of two asphaltic concrete resurfacing projects.

Chart I warrants a word of explanation in that the method of finishing was changed after the completion of the first 7.5 miles. Final finishing of the early part of the work was performed *transversely* with the canvas belt, while the latter half of the work was given a final finish *longitudinally* with the light wooden float, as is now common practice.

Due to the length of time necessary for curing Portland cement concrete prior to its opening to traffic, roughness of such pavements can not be detected with the vialog with the dispatch with which records can be made on asphaltic concrete. For this


PORTLAND CEMENT CONCRETE
Chart II
Roughness-Units Per Mile
0
10
20
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Comparison by Half Mile Sections

reason necessary corrective measures can not be taken on the cement concrete type as soon as on asphaltic pavements.

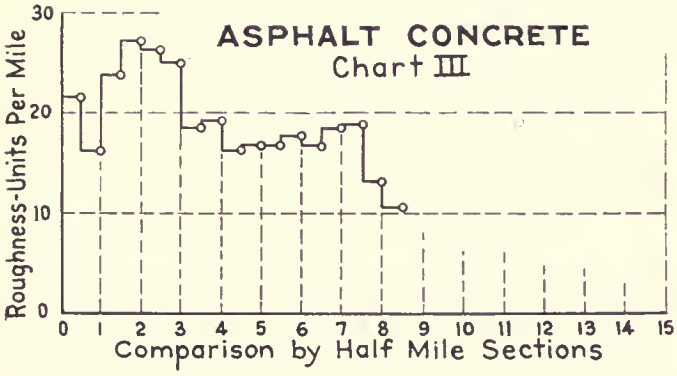
The vialog is also utilized to a large extent in comparing methods of handling asphaltic and Portland cement concrete mixtures to determine the resulting smoothness. Likewise, these investigations lead to changes in the mixtures to increase their workability and result in smoother surfaces.

Vialog installed ready for use.

Readings Made Comparable.

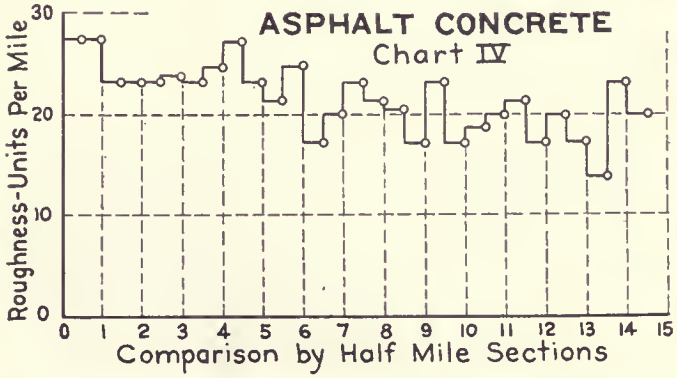
In order to secure records which are comparable with readings on different roads not only in this state but in other states, it is necessary to carefully calibrate the vialog before each test run. Every detail of the operation of the car carrying the vialog must be given attention to secure accurate results. Tires must be inflated to a standard pressure and only tires in uniformly good condition and of uniform resilience are used. The springs are oiled frequently and loading of the car is kept standard for all tests.

Local calibration is effected by running over a section of previously tested road, but standard calibration is obtained by



running over a section of road near Sacramento which has been adopted as the standard test road.

Standard roughness is measured by running over boards of standard width at a fixed speed. The state operates two roughness indicators, a vialog and a roughometer which have both been calibrated to the standard readings of the vialog, since that



instrument has been in use for a number of years and results so far available are recorded in vialog units.

Efforts are being made by the Materials and Research Laboratory to secure the adoption of standard methods and units in the several states in which these instruments are being used, to the end that a nation-wide comparison of results may be had.

"DOING CREDITABLE WORK."

State Highwayman Charles Harbey, in charge of state highway work in the valley with headquarters just south of Lancaster, was here first of the week with his men unloading cars of road-building material with which he intends to improve several small spurs of road, which, when completed, will greatly assist motorists in making small curves. Mr. Harbey is doing splendid highway work, and is keeping the boulevard, which crosses Antelope Valley north and south, in first-class condition. As the feller said: "Harbey knows his onions."—*Palmdale Reporter.*

DIVISION VII WINS LONG FIGHT FOR REMOVAL OF DANGER TREE

THE big oak tree that for a generation or more stood in the center of the roadway on a sharp curve at Duarte, on the Foothill boulevard, Los Angeles County, is now a thing of the past. From the days of the horse and buggy to the era of balloon tires, the old oak was a menace to the traveling public. So numerous were accidents at this point that the tree became known as "Hospital Oak."

For years engineers of Division VII made every effort to have the tree removed, but without success. The owner of the adjoining property claimed legal title to the oak and persistently refused to permit its removal.

DUARTE OAK NO MORE—*Above*, view of the famous Duarte Oak on Foothill Boulevard State highway, Los Angeles County, title of which was claimed by adjoining land owner. *Below*, oak removed as result of efforts of Division VII.

Wreck Brings Change of Attitude.

Recently the division received word that the property was to be sold. The prospective buyer was interviewed, and he expressed a willingness for the tree to be removed. About the same time a motorist traveling at night with his wife and six small children, hit the tree, so disabling his car that he was forced to camp on the roadside for two days while repairs were being made. The angry motorist found the owner and threatened to bring suit for damages.

Due to repeated efforts of Division Maintenance Engineer I. S. Voorhees, the property owner now began to show signs of weakening in his stand regarding the oak. When it became apparent that he would no longer actively oppose felling the tree, instructions were immediately given the district maintenance men, who were eager to see the dreaded hazard to life and property removed from the highway.

All that now remains to tell the tale of accidents innumerable is a patch in the macadam pavement where "Hospital Oak" once stood.

ENGINEER'S INVENTION MAY CHANGE CROSS-SECTIONING METHODS

NOTE—An invention of W. T. Rhodes, Resident Engineer, Division VI, has been in use in that division on several projects and gives promise of revolutionizing methods of taking cross-sections. The following explanation of how it may lower survey costs has been prepared for the Bulletin by Fred J. Grumm, Engineer of Surveys and Plans.—Editor.

SURVEYING instruments such as the transit and level, except for minor improvements have, in many years, changed but slightly in form and principle. The methods, too, of obtaining information in the field form a well established procedure. As a result the rate of progress of a survey party is largely dependent on the ability and application of its personnel. To develop a device or instrument, therefore, which will effect a saving in time and consequently in the expense of surveys should be considered a meritorious accomplishment.

W. T. Rhodes, resident engineer on the Yosemite road, Briceburg to El Portal, has invented a device for cross-sectioning and slope staking which has proved effective in saving both time and labor. It consists of a simple arrangement of scales on a staff or rod, combined in such a manner that distances, vertically and horizontally, to a point are readily obtained graphically when the slope distance is found by measurement.

Horizontal and vertical distances, representing the base and altitude of a right-angled triangle, are read from scales founded on a movable arc revolving about a center of definite height. The slope distance, which is the hypotenuse, is found on the fixed vertical scale. Revolving the arc and sighting the point on which the elevation is desired determines the vertical angle.

Taking Cross-sections.

The operation of taking cross-sections consists of setting the instrument on a station or point whose elevation is known. It is plumbed by means of a rod level attached to the staff and steadied in this position by one man who also holds the tape. The observer sights on the point or rod held by the rodman, who holds the zero end of the tape. The arc is clamped in position and the slope measurement taken with the tape. Applying the slope measurement to the fixed scale, the observer then reads the vertical and horizontal distances directly from the respective scales on the arc.

The device can be used equally well for original or final cross-sections, setting slope stakes, reference points from center line, or reestablishing the center line from reference points. A three-man party can efficiently handle the work in mountainous and rugged country. Where work is light and the progress of cross-sectioning more rapid, the addition of a note recorder is an advantage. Setting of slope stakes in light work is also expedited by the addition of a man to handle the stakes.

The instrument replaces the transit in the method of taking cross-sections by slope angles and slope measurements. Weighing less than ten pounds, it has the advantage of being lighter and more portable; it can be instantly set up. The device eliminates troublesome manipulations, determines elevation and horizontal distances with mathematical calculations, thus reducing possibilities of error. Its simplicity of design eliminates expensive repairs, and its operation does not require an instrument man with years of experience.

Great Time Saver.

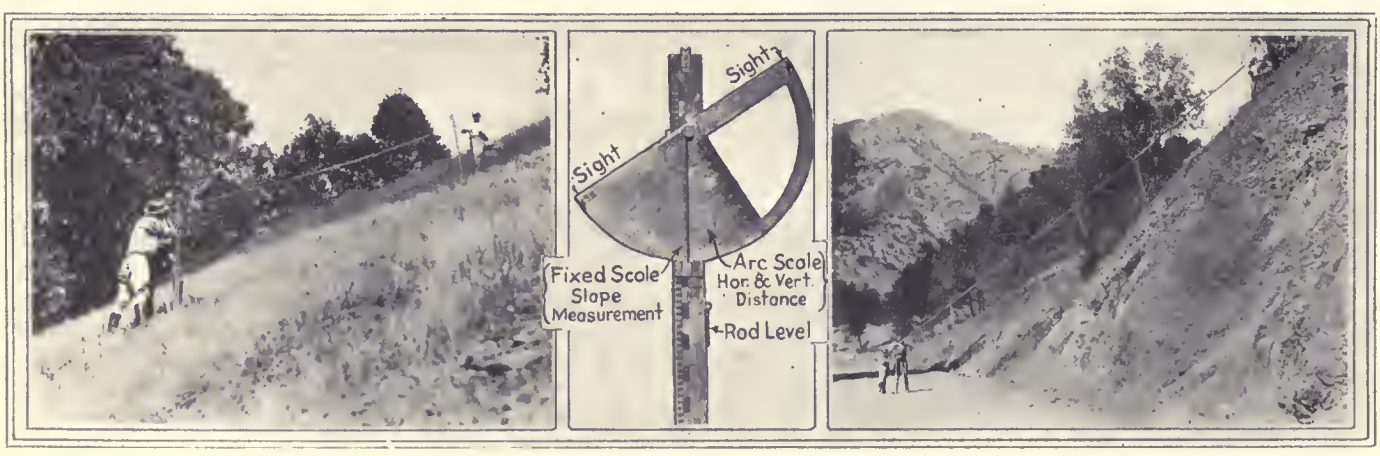
It is estimated by those who have used it, that the work of taking original cross-sections in rough country can be accomplished in one-half the time required by other accurate methods. It is obvious that in level country where side shots are within the limits of the level set up, the time saving is not so great, but where side shots must be obtained by use of hand level or slope angles, the elimination of the possibility of error and saving in time is a decided advantage.

In the work of taking final cross-sections in Kern Canyon, a nine-mile section, a saving of over $300 was made because of the rapid progress possible and the reduction in the size of the party. Because of the simplicity of the notes the sections were easily and rapidly plotted in the field, and, as a result, the party was never held up while waiting for sections to be checked.

There is a reason to believe that the device worked out by Mr. Rhodes will be of considerable value to engineers and that it will change the methods and lessen the cost of obtaining cross-sections, particularly in mountainous country.

DO YOUR PART; PLAY SAFE.

People are shocked at the number of automobile accidents, but if a record were kept of the number of close calls—accidents avoided by a matter of inches—they would be appalled. People who insist upon their right to walk along or stand upon the heavy traffic roads at night take big chances. Drivers facing the glare of oncoming headlights can not see objects immediately in front of them. If you must walk on the highway, walk on the left side and face the traffic; if you must park, park on the extreme edge and keep tail light on; if you must drive a team at night carry lights. These precautions won't eliminate accidents, but they will prolong some lives.—*Belle Plaine (Minn.) Herald.*



DIVISION VI INVENTION—*Center,* device of Resident Engineer W. T. Rhodes which is proving time saver on cross-sectioning and slope staking. *Left,* party using new device on preliminary work. *Right,* instrument in use for taking final cross-sections on Yosemite lateral. A three-man party does the work.

DIVISION V TAKING KINKS OUT OF COAST STATE HIGHWAY

THE Coast highway through Santa Barbara County traverses a hilly country, for the most part scenic, but presenting difficulties in the way of road construction such that the highway, as originally located, has comparatively poor alignment at a number of points. Three contracts are now in progress in Division V for the elimination of several of the most dangerous of these locations.

In Gaviota Canyon, a contract has just been awarded to Oberg Brothers, of Los Angeles, for the construction of a new reinforced

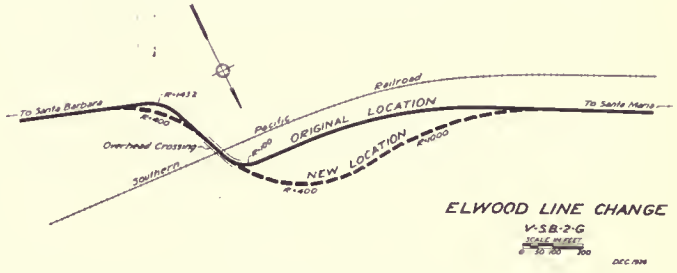
concrete bridge, 192 feet long, on new alignment eliminating an antiquated steel bridge and two very dangerous curves. The bridge was originally located by the county in the days before the state highway and its approach has been the scene of many accidents. A contract for grading the line change will be advertised shortly.

New Alignment at Elwood Overhead.

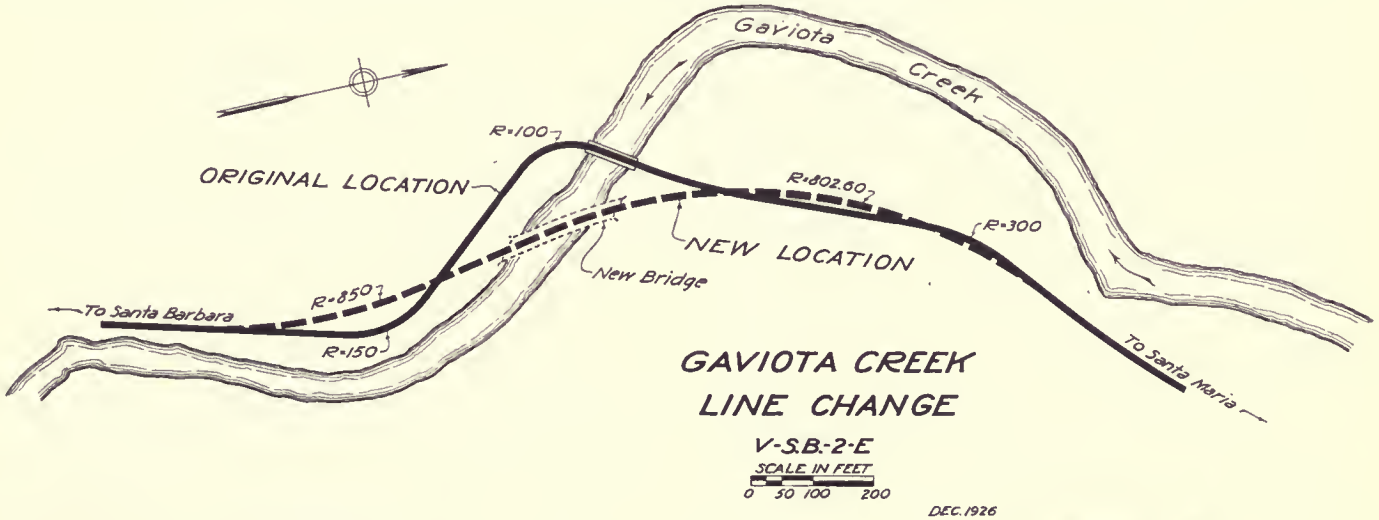
About twelve miles west of Santa Barbara, the highway crosses the Southern Pacific Railroad on an overhead concrete structure, near both ends of which sharp curves have existed. The alignment in the vicinity of this structure is being considerably improved under a reconstruction contract, which was recently awarded to E. Schelling of Los Angeles.

At San Jose Creek, about six miles west of Santa Barbara, the exceedingly sharp curves which existed at the ends of the present bridge have been the scene of numerous accidents. A new concrete bridge is being constructed by Mattock and Feasey, under Contract M-132, and the line which is to connect with the new structure is being graded and paved by the Cornwall Construction Company of Santa Barbara, under Contract M-122.

All of these changes are shown in more detail on the accompanying sketches. Their completion will increase the safety of



the State highway and will make it more nearly adequate for handling present day traffic. Another change which the division expects to have under way in the near future is at Rincon hill, just north of the Ventura County line.



DIVISION VI MOVES INTO PERMANENT NEW HOME

DURING the latter part of November Division VI moved from an uptown office building into its handsome new state-owned division headquarters building at Olive and Carruth avenues, Fresno, which will be its home in the future. From a suite of nine rooms with less than 2000 square feet of space, has been substituted a handsome one-story building, 45 by 85 feet, with 3825 square feet of floor space, and a large basement storage room.

The building has a concrete foundation with floors of the same material. The walls are of brick with a cement plaster finish; the roof is of tile.

After a few weeks in the new structure Division VI reports everybody well pleased with the new arrangement, which eliminates office rent from the division overhead. Adequate quarters with plentiful storage space and a convenient arrangement of rooms and new equipment are expected to increase the efficiency of the staff.

New Shop Also Built.

On the same three-acre site on which the division office is located, there also was completed recently a modern shop building for the Equipment Department. This structure, of steel, tile and concrete construction, is well arranged for shop purposes. It has been equipped with modern machinery for repair of trucks and all manner of machinery and tools used on highway work throughout the San Joaquin Valley and adjacent mountain counties.

WHAT THE DIVISIONS ARE DOING

DIVISION I.

HEADQUARTERS, WILLITS.

T. A. BEDFORD, DIVISION ENGINEER.

Counties of Del Norte, Humboldt, Mendocino, and Lake.

H. W. ROHL has completed his contract for grading and surfacing two miles of new state highway at the southerly approach to the new Douglas Memorial (Klamath River) bridge.

With more than twenty inches of rain already this season, it has been difficult to complete the surfacing of the new grade down Richardson Creek. However, on October 29th, traffic was turned over the new section of highway and across the bridge, thereby eliminating the old county ferry at Requa, which has hindered and limited Redwood highway traffic for years.

Traffic counts in Division I for the last three years show the smallest traffic in the division to be at the Klamath River. A substantial increase is expected in next year's count.

DIVISION VI.

HEADQUARTERS, FRESNO.

E. E. WALLACE, ACTING DIVISION ENGINEER.

Counties of Fresno, Madera, Merced, Mariposa, Kings, Tulare, and Kern, north of the Tehachapi.

ON OCTOBER 21st, Kern County forces, under the direction of Supervisor J. B. McFarland, completed the rebuilding of the old county road between Democrat Springs and Bodfish in Kern River Canyon on the Walker Pass state highway. The formal opening was celebrated with a barbecue and program at Kernville. State Highway Commissioner Nelson T. Edwards and former Division Engineer J. B. Woodson were among the speakers.

This road, including the sections constructed by convict labor and by state contract, is a smooth, scenic route to the Walker Basin country in eastern Kern County. It is open via Walker Pass to a connection with Owens Valley trunk highway east of the Sierra.

Four miles of state highway between Famosa and Earlimart were under water during recent unprecedented floods. However, maintenance crews of Division VI, assisted by Kern County traffic officers, under the direction of Captain Snell, safely and expeditiously handled the traffic. Acknowledgment is made by the division to the men of the traffic force for their invaluable aid, and also for the willing spirit in which it was rendered.

As this incident demonstrates, the State Highway Commission is becoming more and more an operating as well as a constructing department.

DIVISION VII.

HEADQUARTERS, LOS ANGELES.

S. V. CORTELYOU, DIVISION ENGINEER.

Counties of Los Angeles, Ventura, Orange, San Diego, and eastern Kern, south of Mojave.

PLACING concrete on the reconstruction of 3.2 miles of Whittier boulevard, extending westerly from the Orange County line, is now well under way. The pavement will be 30 feet wide with two-foot crushed rock shoulders. It is being placed in 10-foot strips.

Contractor Works Fast.

Good progress is being made on the reconstruction of the Coast highway westerly from Ventura. Otto Parlier, subcontractor on the construction of 1500 lineal feet of seawall, arrived on the job on October 29th. He had a power shovel in operation on November 6th and was pouring concrete on November 15th. By the end of November he had placed 470 cubic yards of concrete and had 300 lineal feet of coffer-dam completed ahead of the concrete work.

On the recently completed 6.3-mile section of cement concrete pavement through the Malibu ranch, extending westerly from Las Flores Canyon, an exceedingly smooth surface was obtained. The vialog reading averaged 4.1 inches of roughness per mile. This may be the record for California for 1926 pavements.

Grading is practically completed and about a mile of headers for the concrete pavement have been set on the Oxnard-Hueneme road cutoff, the approach to the new Coast highway in Ventura County.

Type of railroad crossing warning in use in Division VI. The center is a Redflex lens.

DIVISION VIII.

HEADQUARTERS, SAN BERNARDINO.

E. Q. SULLIVAN, DIVISION ENGINEER.

Counties of San Bernardino, Riverside, and Imperial.

AS THIS issue of the Bulletin goes to press, Division VIII is bending every effort to the repair of widespread damage to the El Centro-Yuma and the El Centro-San Bernardino highways caused by rain and floods of unprecedented severity. The storm was declared the worst for over fifty years and very serious damage was done to pavements, roadbed, and bridges.

Contract No. 491, known as the Sand Hills paving project, has been completed and recommended for acceptance.

It is expected that completion of the new division office will permit the forces of Division VIII to move from the San Bernardino City Hall to the new building, located at 247 Third street, within the next few weeks. Division VIII is very proud of its new building, and the employees are anxiously awaiting the order to move.

DIVISION IX.

HEADQUARTERS, BISHOP.

F. G. SOMNER, DIVISION ENGINEER.

Counties of Inyo, Mono, and eastern Kern County, north of Mojave.

SEVERE rain and wind storms early in the month halted only temporarily operation of the crushing plant engaged in the production of surfacing for the ten-mile section of State highway between Independence and Lone Pine, Inyo County.

Owing to a heavy fall of snow in Mono County, work has been discontinued on the grading of 3.65 miles of highway south of Bridgeport.

Blizzard Traps Crew.

Grading of a three-mile section of highway in Long Valley, Mono County, has been completed. The crew, subsequently engaged in preparing the mountain roads for winter, was caught in a blizzard and was forced to abandon its equipment, which was left on Deadman Summit. This was later recovered by state forces working under the commendable leadership of Foremen

Paul Peak and Ray Flynn, and returned to the Bishop maintenance yard.

The task involved grinding trips on snow shoes night and day, and bucking snow with tractors in isolated localities where the dangers are traditional.

Occupation of snow-bound roads by state employees and equipment was of valuable assistance to the Southern Sierras Power Company in the restoration of power and telephone service.

The State highway between Mojave and Bishop is rapidly being restored to normal following recent storms. North of Bishop the highway is closed by snow.

DIVISION X.

Headquarters, SACRAMENTO.

R. E. PIERCE, Acting Division Engineer.

Counties of Amador, Calaveras, Alpine, Tuolumne, Stanislaus, San Joaquin, Solano, and southern Sacramento and Yolo counties.

UNDER contract No. 514 (road X, Yol-6-C), all cement concrete pavement and macadam pavement (approaches to the concrete pavement) have been completed by Contractor H. Brown. This job is now complete with the exception of constructing concrete sidewalks and hand rails through the new West Sacramento subway; and the placing of gravel borders on each side of the concrete pavement, from the M street bridge westerly, the completion of which, it is expected, will be accomplished before the first of the year.

Construction of gravel roads through the grounds of the Stockton State hospital and farm is under contract by Force, Currigan & McLeod for the Division of Architecture. Inspection of this work is in charge of the engineering forces of Division X.

Priest Grade Is Being Widened.

Maintenance Superintendent H. L. Montford has a 1 1/3 cubic yard power shovel at work on Priest's grade, where needed widening operations have been started. This work should prove popular with the public, as Priest's grade, with its many curves, has been feared by many motorists, who use the road on their trips to and from Yosemite via Big Oak Flat.

The narrow Mokelumne River grade on the Mother Lode highway, south of Jackson, Amador County, is being widened and sharp points are being blasted away to make possible better vision around curves. The work is being done jointly by Foremen H. S. Clark and Frank M. Walker.

Heavy rains followed by a cloudburst washed away a garage and six machines in Angels Camp, and water flowing down the creek reached a depth of five feet over the Angels Camp bridge. In spite of the heavy rains, which were more or less general throughout the division, no serious damage was done to State highways.

STATE ROADS IN GOOD CONDITION.

(From the Maricopa *Review.*)

Much praise is due the division maintenance man of the State Highway Commission, E. F. Allard, of the local division, for his efforts following the last rain here, when he immediately put drags and harrows on the unpaved roads of his district and has left them in good condition.

Mr. Allard is an expert road builder and the Commission has in him a man that is always alert to every possibility in bettering the roads under his supervision, which is more than appreciated by the people of this district.

Since coming here and taking charge of the surrounding roads under the state's supervision Mr. Allard has placed them in excellent condition, and is being complimented for his endeavor to keep them in a passable state during heavy rains and cloudbursts.

ILLINOIS ROAD MILEAGE.

Illinois now has 5966 miles of completed hard roads in its state highway system, according to the California State Automobile Association.

Vegetable Seller—"But why are you putting your hat on the cabbage, sir?"

Customer—"My wife told me to get one about as big as my head, so I'm seeing if the hat fits."—*Tarikaturen,* Oslo.

HEADQUARTERS AND DIVISIONS III AND X IN NEW BUILDING

AS THIS issue of the Bulletin goes to press headquarters and Divisions III and X are enjoying an appreciated Christmas present from the Board of Control—their permanent new home in the four-story Strub Building at Eleventh and P streets, two blocks from Capitol Park. In addition to the highway offices, the building houses on the first two floors the Division of Motor Vehicles and the Bureau of Criminal Identification.

The Highway Commission headquarters staff has the entire third floor, while the fourth floor is occupied by the offices of the two divisions having headquarters in Sacramento.

Larger and better lighted and ventilated quarters for the drafting forces and for the accounting department, as well as other departments, are only some of the many splendid features of the new building. There also is ample space for storage of supplies, something that was badly needed, and special rooms for the blue printing and photostating work, which has been transferred from the laboratory.

The building is of reinforced concrete construction with a frontage of approximately 160 feet on each street. It was planned and built for the particular use of the departments now occupying it. The State of California has a long-term lease on the property with the privilege of purchase, which may be exercised at the option of the legislature. Negotiations for the construction of the building, which was erected by San Francisco capital, were carried on by George G. Radcliff, chairman of the State Board of Control.

HIGHWAY NEWS NOTES

THE California Highway Department recently had as its guests two engineers from South Africa, I. B. Shannon, from the irrigation department of the South African government at Pretoria, and N. Shand, who is connected with the Capetown Corporation of Cape Town. The two men spent several weeks investigating highway construction in California.

Howard Noble, resident engineer of Division VIII, is now convalescing in a southern California hospital following a recent serious operation.

Eugene Sorin and R. W. Hanchette are new draftsmen who recently joined the forces of Division X. Sorin is from Eagle Rock.

Miss Beulah Francisco, popular headquarters personnel clerk, is now Mrs. James J. Doherty, following her recent marriage in Sacramento.

A. K. Forrest, maintenance superintendent, has been transferred from Division III to the headquarters maintenance office under T. H. Dennis.

L. I. Smith is now connected with the office of the State Purchasing Agent at the Capitol Building.

George Cook, secretary to the State Highway Engineer, has been away from the office recently because of illness.

Carl Tunison, an engineer formerly on the staff of the commission, passed away recently in a San Francisco hospital.

The removal of the Highway Department to its new building has resulted in the transfer of Mrs. Alice M. Nathan, for many years head telephone operator for the commission, to the central telephone office in the Capitol Building.

PUBLIC HIGHWAYS.

We wish to commend Mr. Somner, division engineer of the State highway, on his judgment and ability in the construction and maintenance of the State highway through Inyo County, and to express a desire that the road from Bishop to the Nevada state line by way of Laws be taken over by the state and taken care of in a like manner.—From the 1926 Report of the Inyo County Grand Jury.

Painter (airily)—"My dear fellow, I paint a picture in two days and think nothing of it."

Critical Friend—"I quite agree with you."—*Answers,* London.

STATE HIGHWAY FUND CONTRACTS (Bond Funds, Including Federal Aid)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE NOV. 16, 1926.						
490	I	Del Norte	1	A	Head of Richardson Creek to Klamath River	2.02	Grading and Rock Surfacing	H. W. Rohl	$98,145 00	Dec. 14, 1925	
491	VIII	Imperial	27	B	Across the Sand Hills	6.45	Asphalt Concrete Pavement	Schmidt and Hitchcock	340,016 91	Dec. 30, 1925	
510	IV	Sonoma	1	A	Through Cloverdale	1.33	Portland Cement Concrete Pavement	J. V. Galbraith	58,570 31	July 14, 1926	
					AWARDED SINCE NOVEMBER 16, 1926.						
517	I	Humboldt	1	G	Between Fernbridge and Loleta	2.10	Grading and Rock Surfacing	Kaiser Paving Co.	$97,530 01	Dec. 15, 1926	200
					Sub-total	2.10			$97,530 01		
					PENDING AWARD—None.						
					Total State Highway Fund Contracts Awarded and Pending Award	2.10			$97,530 00		

NOTE.—Primary construction covered by the above contracts does not include funds obligated on cooperative forest highway projects, prison camp road activities, or day labor jobs not being done under contract.

STATE HIGHWAY MAINTENANCE FUND CONTRACTS (Including Gasoline Tax Fund)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE NOV. 16, 1926.						
M-111	VII	San Diego	2	B	Carlsbad Crossing of A. T. and S. F. R. R.		Concrete Girder Bridge	Coon Brothers	$20,666 25	Dec. 14, 1925	
M-128	IV	Santa Cruz	44	A	Between Boulder Creek and California Redwood Park		Concrete Bridge and Three Culverts	Noble Brothers	16,687 12	June 8, 1926	
M-140	VI	Fresno	4	B	Between Church Avenue and Cherry Avenue	0.60	Asphalt Concrete Surfacing and Wid...	Cal. Road and Street Imp. Co.	16,973 28	Aug. 28, 1926	
					AWARDED SINCE NOVEMBER 16, 1926—None.						
					PENDING AWARD—None.						

NOTE.—The above obligations charged against the State Highway Maintenance Funds do not include funds from these sources obligated for general maintenance and for specific betterments being done under day labor authorization.

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A BULLETIN ISSUED BY THE CALIFORNIA HIGHWAY COMMISSION FOR THE INFORMATION OF ITS EMPLOYEES AND THE PUBLIC

Vol. 4 JANUARY, 1927 No. 1

C. C. Young, inaugurated twenty-sixth Governor of California, January 4, 1927.

In this issue: EXCERPTS FROM GOVERNOR YOUNG'S MESSAGE—SECRETARY JARDINE SETS GOAL FOR FEDERAL AID—BUILDING THE HIGHWAY THROUGH FAMOUS RANCHO MALIBU.

FEB 12 1927

CALIFORNIA HIGHWAYS

This Bulletin is published by the California Highway Commission for the information of its employees and the public. Editors of newspapers and others interested are welcome to use, without restriction, any of the matter herein contained. Cuts will be gladly loaned upon request.

FRANK B. DURKEE - - - Editor

P. O. Box 1103, Sacramento, California.

Vol. 4. JANUARY, 1927. No. 1

CALIFORNIA HIGHWAY DEPARTMENT

C. C. YOUNG, Governor.

CALIFORNIA HIGHWAY COMMISSION

RALPH W. BULL, Chairman, Eureka

J. P. BAUMGARTNER, Commissioner, Santa Ana

R. M. MORTON, State Highway Engineer, Sacramento

PAUL F. FRATESSA, Attorney, San Francisco

W. F. MIXON, Secretary, Woodland

HEADQUARTERS STAFF, SACRAMENTO

T. E. STANTON, Assistant State Highway Engineer

L. V. CAMPBELL, Office Engineer

FRED J. GRUMM, Engineer of Surveys and Plans

Bridge Engineer

C. S. POPE, Construction Engineer

R. H. STALNAKER Equipment Engineer

T. H. DENNIS, Acting Maintenance Engineer

C. L. McKESSON, Materials and Research Engineer

BEN H. MILLIKEN, Superintendent of Prison Road Camps

HERMAN B. WEAVER, Chief Accountant

DIVISION ENGINEERS

T. A. BEDFORD, Division I, Willits

H. S. COMLY, Division II, Redding

F. W. HASELWOOD, Division III, Sacramento

J. H. SKEGGS, Division IV, San Francisco

L. H. GIBSON, Division V, San Luis Obispo

E. E. WALLACE (Acting), Division VI, Fresno

S. V. CORTELYOU, Division VII, Los Angeles

E. Q. SULLIVAN, Division VIII, San Bernardino

F. G. SOMNER, Division IX, Bishop

R. E. PIERCE (Acting), Division X, Sacramento

General Headquarters, Third Floor, Strub Bldg., Eleventh and P Streets, Sacramento, California.

WHEN a road building engineer thinks that he knows it all, he is on the toboggan. In all branches of our work lie opportunities to improve results or to reduce cost.

This idea is sharply exemplified in the inside history which preceded the construction of the excellent oil-surfaced gravel roads in Division I. When Division Engineer T. A. Bedford advanced the idea of using a portion of his annual allotment of general maintenance funds to defray the cost of a light application of heavy oil, he met with little encouragement on the part of some of our supervisory engineers, who thought they knew something about what could be done with oil.

In spite of this, goaded by desperation caused by seeing the valuable gravel turned into dust clouds and carried away by the wind, Engineer Bedford insisted, experimented, failed, persisted and triumphed in his endeavor to produce an asphalt seal top at low expense, on a rough gravel base full of clay and boulders.

Bedford's maintenance allotments seemed less adequate each year. The traffic increased and with it the complaints of travelers about the dust. The gravel surface disappeared at an alarming rate. Bedford is an engineer who keeps his eyes and ears open and takes advantage of the breaks. His oiling ideas were not necessarily original. Lessons learned in early road building experience in Los Angeles County were not forgotten. He observed enough the year before, viewing experiments in a neighboring state, to set him thinking.

(Continued on page 5.)

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EVERY employee of the highway commission has a direct interest in the improvement of the highway organization's methods and results, both engineering and clerical, office and field. To that end, the State Highway Engineer invites constructive criticism or suggestions from every employee.

Ideas as to the more economical and efficient handling of your job, or suggestions for elimination of waste will be welcomed. Criticism is also desired from persons outside the organization, who are in a position to give facts.

Send only signed communications addressed as follows: California Highways, P. O. Box 1103, Sacramento, Cal.

JANUARY 1927 | California Highways | VOL. 4 No. 1

Governor Young's Inaugural Message Gives Important Place to Highway Policies

AN OUTLINE OF THE POLICIES of the new administration with reference to the state highway situation was enunciated by Governor C. C. Young in his inaugural address, on January 4th, before the joint session of the Legislature. In an unequivocal, forward looking statement, the Governor declared his belief that the problem now of most general interest to the people of California is the completion of the state highway system. To meet the state-wide demand for a resumption of work upon the highways, he suggested to the Legislature the necessity of adopting some plan which will provide the funds necessary for new construction. He expressed also the hope for an extension of the prison road camps as a part of his program with relation to the prisons.

Parts of the message of Governor Young having to do with highways and prison road camps, are as follows:

I PASS now to certain problems of the state's material welfare, which must be solved, and speedily solved, if the growth and development of California is to continue unretarded: **I believe that the problem of most general interest at the present time is the completion of our state highway system.**

I shall waste no words in emphasizing the importance of this problem, or the economic value of providing, at the earliest possible moment, a completed system of state highways. I believe that the speedy completion of our highway system is an end desired by every citizen. The only question is the best method of securing the necessary revenues.

In the first place, it is clearly impossible to secure our necessary highway revenues from the state's general fund. To do this would inevitably lead to the necessity of imposing a state ad valorem tax upon our citizens, already suffering under too great a burden of local taxes.

Secondly, I do not believe that at present we should attempt to divert to the construction of new roads the money now being used to save our existing roads through the reconstruction process of widening and thickening.

Finally, I am convinced that we should not depend upon the issuance of bonds for this purpose, partly because of the extra expense involved, and partly because we can not afford to delay our highway work by waiting two years for a bond election.

Accordingly, if we are to satisfy the almost **universal** demand that we at once resume work upon our state highway system, we are thrown back upon the necessity of adopting some plan which will produce the necessary revenues. It is true that such a plan was defeated at the recent election, but when we consider the narrow margin of the defeat, and analyze the reasons for it, I am sure that **it is not to be taken as a verdict of the people against the general proposition,** nor as precluding the legislature from now undertaking to find some solution of it which will be assured of general approval and acceptance.

I believe, that with proper regard for the interests involved, the legislature should determine upon a policy through which this vitally important problem may be solved. Toward this policy I offer the following suggestions:

First, let the northern and southern sections of the state determine upon a list of roads, such, for instance, as all interstate roads and other roads included in the first bond issue, to be set aside as a charge against the state as a whole.

Second, let the revenues for remaining roads, both for construction and reconstruction, be allocated fairly and equally between the two sections of the state.

Finally, fix upon a gasoline tax, or some equivalent method for the financing of new roads; and thus, by giving this proposition a fair trial, permit the coming administration to show what can be done in highway construction, to the satisfaction and for the benefit of the entire state. It is unnecessary to point out that the problem must not be complicated by any attempt to add to the present state highway mileage at this time.

I BELIEVE that in our penal institutions every effort should be made to study the individual prisoner, and to restore him, whenever possible, to useful citizenship. I do not believe, however, that the criminal should be sentimentally pampered as the innocent victim of untoward circumstances. I believe that the prison should provide plenty of work, wholesome food, medical attention, and an opportunity for self-development through education, but there should be no reason for criminals to regard it is a desirable place of residence.

Furthermore, I believe in a careful segregation of prisoners, so that the first offender may escape contamination by the hardened criminal. I believe in a wise and conservative use of the parole system, to be applied to such prisoners as the parole board feels morally certain of redeeming thereby. However, I also believe that parole is rarely justified in the case of a repeater, or habitual criminal.

I emphatically believe in the prison road camp, and hope to see its work extended as rapidly as possible, in order that discharged prisoners may leave with strong bodies, and such small sums of money as they have honestly earned, thus giving them a fairer chance to break away from crime and criminal associations.

Finally, I believe that we should lose no time in relieving the intolarebly crowded condition in our own state prisons, where two, and sometimes three, prisoners are confined in the same cell. I also believe that San Quentin is no place for our women prisoners, and I would favor the appointment of a commission, consisting partly of women, to plan for the establishment of a separate penal institution for woman offenders.

Secretary Jardine Urges Completion of Interstate Routes

SECRETARY OF AGRICULTURE WM. M. JARDINE, in his recent comprehensive address at Pinehurst, North Carolina, before the annual meeting of the American Association of State Highway Officials, placed before the road builders of America a definite goal—completion of the initial improvement of the primary system of transcontinental highways by 1930. This definite object, he asserted, is possible of accomplishment and by it both the federal and state governments will have kept faith with those who provide funds for highway building.

To establish the 80,000 miles of important interstate routes in the public mind as an entity, the secretary urged as essential the consummation of plans for their uniform signing and numbering as already recommended by the joint board of state and federal engineers.

What Federal Aid Has Done.

The remarkable improvement in roads during the last ten years and the increase in highway transportation, the secretary pointed out, has been the greatest in the history of the country. Coincidentally this same decade covers the period of federal aid road legislation and its administration under the Department of Agriculture. In 1916 there were less than 2,500,000 motor vehicles in the country, of which only 73,000 were registered as motor trucks. Today the registration is in excess of 20,000,000 and commercial vehicles alone are in excess of the total registration of ten years ago.

The decade also has witnessed the organization of efficient highway departments in all of the states; research and experimentation have made important contributions to engineering science and have resulted in increased service from highways at a lower cost; equipment has been made more efficient and numerous new devices have added to the speed of construction.

Stage Construction Approved.

Stage construction of highways, which is the policy being followed in California, was heartily approved by the secretary in the following words:

"The problem of the present is to serve as adequately as possible the present needs, keeping in mind at the same time the greater needs of the future, and making suitable provision for their accommodation when the time arrives. This is the policy of stage construction, a sound policy because it recognizes the utter impossibility of building once for all a system of highways which may be regarded as a finished product, but rather substitutes for that conception the principle of progressive improvement.

"The construction of earth roads on the lines and grades and with the drainage provisions that will be required by the pavement of the future is a recognized application of the state-construction principle. But it has much wider applications than that. The acquisition of rights of way of *ample width* for the future so that, when the need arises, it will be possible without heavy expense or the injury of private property to effect the necessary improvements, is another highly important application. The same foresighted policy suggests the location of the improved highways in relation to railroads at crossings in such manner as to provide satisfactorily for separation of grades, and it applies also to provisions for the construction of future by-pass highways around cities, and for the diversion of traffic from routes of growing congestion.

"To anticipate thus the needs of the future implies a knowledge of the probable traffic importance of the various roads which can only be obtained by a careful and detailed study of the present distribution and the factors inherent in the economic and physical characteristics of the state.

"The highway department that has in its possession such information as these surveys supply can really plan for the future. It has substituted facts for opinions; it knows the present and probable future importance of its roads; it knows the density and also the weight of the traffic to which each road is now subjected and to which it is likely to be subjected in the near future. It can, therefore, devise a reasonable program of construction extending into the future, it can budget its funds intelligently; it can determine the order in which the various highways should be improved and give a satisfactory answer to those who favor priority for other roads; and it has in its possession an adequate basis for the necessary decision as to the character of improvement required for each road.

"This is sound and businesslike administration of highway improvements. It is the reverse of the casual and haphazard procedure which too often has subjected the business of highway improvement to political manipulation, and produced discontinuous, unbalanced, and uneconomical development instead of well articulated systems of improved highways."

Importance of Maintenance.

Discussing the important subject of maintenance, the secretary said:

"Looking to the future also there must be a still greater improvement in the maintenance of all roads and especially of the federal-aid roads, an obligation which the federal law places upon the state highway departments. While unquestionably there has been great improvement in this respect during the last decade, the failure to make proper provisions for the repair of roads upon which large sums of public money have been invested is the sheerest of economic folly. Unless there is positive assurance that means will be available for the constant and continuous care of the roads after they are improved, I am convinced that it would be better not to improve them at all.

"While the states in accepting the federal appropriations accepted also the obligation of keeping the roads in proper repair, the deeper obligation is that of rendering the best possible service to the public and of protecting public investment."

BRIDGES IN SMITH RIVER CANYON—Views of typical reinforced concrete structures built by United States Bureau of Public Roads on the Redwood highway, Del Norte County, as part of a forest highway project.

Primary System Nearing Completion.

Secretary Jardine sees a great system of national highways taking form as a result of federal and state cooperation. Coming to the closing paragraphs of his address, he held up before the assembled highway officials the vision of those who, in 1916, worked for the passage of the first federal-aid law. Discussing the completion of the primary system of federal-aid routes, he said:

"With each year's progress now it becomes easier to see the working out of one of the primary conceptions of the federal-aid road legislation as expressed in the requirement to expedite the completion of an adequate system of highways interstate in character. It was foreseen that the fulfillment of this purpose would come through a linking up of sections of main highways as they are developed state by state, and up to this time the programs within the states have in general been in harmony with the expected progress in the direction of through routes. In some cases the department has taken definite positions with reference to specific projects to provide missing links, usually in the way of bridges at state boundaries, but now with the major routes of the country so clearly defined by the action of the states through this association, the unimproved sections of these routes have been brought in strong relief.

"There may be critics who hold that the ten-year period covered by this legislation should have produced more transcontinental routes fully improved.

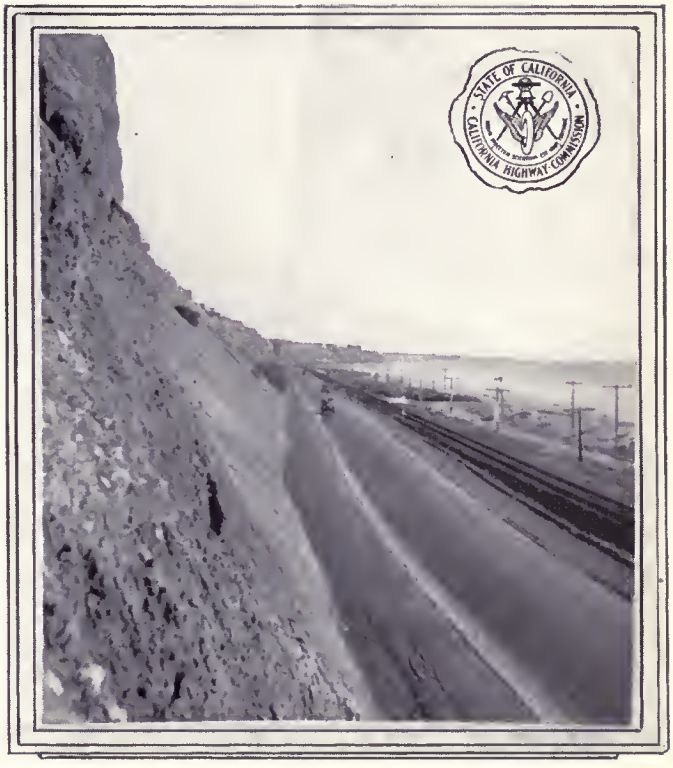
"There are two answers: The actual operations of the federal highways legislation did not get under way until well into the year 1919, and the tremendous development of motor vehicular traffic, particularly around every center of population, large and small, local rather than transstate in character, has necessitated first, attention to the immediate service demanded. It is my feeling that the progress in the completion of transcontinental roads is gratifying, but I do not lose sight of the fact that the lack of transstate routes in the agricultural states of the Mississippi Valley is not in keeping with the development, east and west. In specific states this condition is brought about more largely by dependence upon county financing (which the secretary did not approve) than upon any lack of need of such roads or lack of response on the part of the state highway departments.

"Now that there has been plainly pointed out and defined the through routes which are of major national importance, there should be an energetic effort made to improve the missing links, not because they are transcontinental routes but rather because in general these unimproved sections are on the most important state routes, and the failure to improve these imposes a handicap upon the people of each state in the satisfactory use of their own road systems. But the *national* use must not be lost sight of, nor the requirement of the national legislation that these interstate routes shall be expedited.

"The department has not attempted to dictate the routes which should be regarded as major state routes. Neither for that matter have the state highway departments. Through the careful work of the Joint Board of Interstate Highways, and the executive committee of the association, each state highway department has expressed in a definite way the routes which are of the greatest importance within the state. In other words, this system of interstate routes has been built from the local viewpoint upward and not from the transcontinental viewpoint downward.

"But having now settled upon these routes, which is the last analysis the public itself has defined by their use, it becomes our duty, the federal and state highway departments working in cooperation, to expedite their completion. There are approximately 80,000 miles of highway included in these routes. To complete them to a state of improvement satisfactory for present use is a matter of closing gaps. I am convinced that this, the initial improvement, can be completed by 1930 without difficulty, and as a definite objective I can think of no expenditure of effort which would bring with it a greater return of public satisfaction or any more intelligent method of keeping faith with both the federal and state governments which have entrusted to us the administration of these large funds.

"From the federal point of view the early improvement of these routes is of large importance, and I ask your full support in an effort to complete the unimproved links at the earliest possible time and to bear with this department in a reasonable but insistent demand that the federal funds so far as possible be dedicated to this purpose with the full consent and belief on the part of the highway departments that the end is desirable and worthy."



ALONG THE OCEAN—State Highway on the Orange County coast, widened to twenty feet and thickened.

GOVERNOR YOUNG APPOINTS TWO HIGHWAY COMMISSIONERS

SHORTLY after his inauguration on January 4th, Governor C. C. Young announced the appointment of Ralph W. Bull of Eureka as chairman of the California Highway Commission to succeed Havery M. Toy of San Francisco, resigned. J. P. Baumgartner of Santa Ana was appointed commissioner to succeed Nelson T. Edwards, resigned. As this issue of the *Bulletin* goes to press, the third member of the commission to succeed Commissioner Louis Everding, whose resignation was accepted on January 17th, had not been named.

The *Bulletin*, in a subsequent issue, plans a more formal introduction of the new commissioners to the personnel of the department and to its other readers throughout the state.

STRAIGHT FROM THE CHIEF

(Continued from page 2.)

The results in Mendocino County on Route I are little short of marvelous, considering the condition of the road before the oil was applied. Excellent results have been obtained at very low cost. An extensive program, largely based upon his success, is planned for 1927-28 in other divisions, in protecting rock-surfaced roads with oil.

The proper development of highway construction and maintenance, to obtain better and more pleasing work at less cost, requires the highest order of intelligence, and an attitude of open-mindedness on the part of engineers. The man who thinks conditions are stabilized, and that he knows it all, is only sliding backwards.

Highway Construction Through Famous Rancho Malibu

Reported by C. P. Montgomery, Resident Engineer, Division VII.

IN contrast to the years of litigation attendant upon efforts to secure an adequate right of way, the California Highway Commission, in a comparatively short period, has completed all of the grading and a part of the paving of state highway route 60 through the famous Rancho Malibu Sequit y Topango, from Santa Monica, in Los Angeles County, northward to the Ventura County line.

Several issues of the *Bulletin* could be devoted to a complete story of the battles, legal and otherwise, which have resulted from the efforts of Los Angeles County and the state to open to public travel a highway along this section of the southern California coast, to provide another needed outlet for traffic northward from Los Angeles. Litigation with reference to the Malibu rights of way has reached the Supreme Court of the United States, while various phases of the controversy have been before the courts of Los Angeles and Ventura counties for years.

The road was added to the state highway system by bond issue of 1919 as a part of the Oxnard-San Juan Capistrano coast highway. Its completion will provide a travelable highway in sight of the ocean from San Diego to Santa Barbara, a road which will bring added fame to California's system of highways.

The first construction work on the Malibu section of Route 60 consisted of 7.4 miles of 20-foot cement concrete pavement, 6 inches thick, reinforced, placed in 1921. Following this, some grading work was done by state forces in 1923 and 1924, pending a further effort to obtain rights of way.

Grading Contract in 1925.

The next contract, for grading 16.13 miles through the Malibu, from Arroyo Sequit to Las Flores Canyon, was awarded early in 1925 to S. Wright Jewett of Los Angeles, and was completed on October 23, 1926, by subcontractors of the Southern Surety Company, assignee.

This section follows for the most part the shore line with practically no grades of any consequence. Where it was found necessary to leave the beach, the highway leads across a high mesa, overlooking on one side the ocean, while from the other may be had a splendid view of the Santa Monica mountains.

It was found desirable after construction started to make a number of changes in the original plans, particularly with reference to grade lines and drainage structures. Besides 460,667 yards of roadway excavation, the contract involved considerable station overhaul, placing of 125 pipe culverts and headwalls; construction of ten box culverts with openings ranging from 3′ by 5′ to 10′ by 10′; a large arch culvert 135 feet long; and a 20-foot reinforced concrete bridge.

Temporary crossings were provided at eight large waterways where bridges are to be built by Los Angeles County. Three of these structures, those across Malibu Creek, Solstice Canyon, and Corral Canyon, are now under construction.

Johnson Paving Contract.

Upon completion of the grading between Latigo Creek and Las Flores Canyon, a second contract was awarded to Ed Johnson and Sons of Los Angeles for the construction of a cement concrete pavement between these points, a distance of 6.7 miles. This contract, which was recently accepted by the commission, was carried on in the face of difficulties and there are several features of interest to engineers.

TRANSPORTATION. The inaccessibility of the Malibu region, by road or rail, presented difficulty in the handling of material. Therefore the proportioning plant for the entire job of necessity was located near the Santa Monica city limits on the Pacific Electric line and materials were hauled in batches from that point. The minimum haul was nearly seven miles and the maximum was over thirteen miles.

Materials were shipped to the job in gondolas, where they were unloaded by crane equipped with a clamshell bucket into bins or stock piles. Coarse aggregate was delivered separately in 2½-inch and 1½-inch sizes. The plant was equipped with three bins, one for sand and two for rock. The latter were combined in proportions as determined by frequent grading tests. All aggregates were proportioned by weight.

Blending of Aggregates Difficult.

The small space available for stock piles, allowed room for the storage of only two cars of each size of aggregate and made it necessary to load most of the aggregates directly into the bunkers from the cars. This lack of adequate stock piles upon which to blend the aggregates, made necessary a very careful check of the grading and frequent adjustments of the paving mix.

Difficulties of the situation were overcome largely through the energy and skill of Assistant Resident Engineer R. H. Rowe, who was in charge of the proportioning plant.

BATCHING. Aggregate was hauled to the mixer in five-ton batch trucks. The cement was loaded on the trucks as it passed the warehouse after leaving the bunkers, five sacks being placed over each compartment. As a protection against moisture in the aggregate, and to prevent loss from wind or leakage during the long haul, the sacks of cement were not emptied until the load reached the mixer.

SUBGRADE AND EMBANKMENTS. From Las Flores Canyon to Winter Canyon the grade was made either of beach sand or a very sandy material. However, from Winter Canyon to Latigo Creek, the center line of the roadway followed closely the roadbed of the abandoned Hueneme, Malibu and Southern railroad. In widening the old embankment to provide a roadbed of 40 feet, heavy fills were made in places along the shoulders.

Embankment Puddled for Full Width.

To provide against a future settlement of the subgrade or of the shoulders, the full width of the embankment was compacted by puddling. Earth dykes of lengths determined by the grade, and 12 inches deep, were constructed covering the full width of all fills having a depth of 18 inches or more. To secure a rapid and uniform penetration holes, four feet apart, were jetted in the dykes by means of a ¾-inch pipe to which was attached a 2-inch hose.

Flooding was continued until tests with a soil auger showed the moisture to have penetrated the full depth of the fill.

While there was a decided compression during the puddling operations, the roadway stood through the heavy spring rains and later was subjected to the traffic of a fleet of 5-ton batch trucks, with no apparent settlement at any point. It is not believed that further serious settlement will take place.

A careful investigation of soil conditions showed satisfactory subgrade material on the section to be paved, except between Solstice and Winter canyons. Here the tests indicated a shrinkage of 5 to 12 per cent. To overcome this, the subgrade between these two points was cut low and a cushion of several inches of sand provided. This sand was hauled from the nearby beach in Ford dump trucks.

PAVEMENT DESIGN. The design for the Johnson contract, in so far as it concerned the pavement section, exemplifies the latest California practice. **This design provides for a Portland cement concrete pavement 20 feet wide and 7 inches thick, increasing in a distance of 2 feet to a thickness of 9 inches at the center and edges.**

Such a pavement was laid over 6.3 miles of the distance. On the other 0.4 of a mile, because of heavy fills, there was placed a water-bound macadam, 5 inches thick, surfaced with 1½ inches of type "B" bituminous macadam. Rock borders, 5 inches thick and 2 feet wide, were placed along either edge of the pavement for the entire length of the contract.

Longitudinal Joints.

The method followed on the Johnson contract in the construction of the longitudinal center joint is an experiment, so far as this state is concerned. The joint was made by using a 14-gauge chan-

nel type metal plate, 9 inches high. Keeping a center joint made by this means to a true line proved difficult, however, and the length of the iron pins driven through the channel in the joint had to be increased from 15 to 19 inches. A metal channel of 3/16-inch steel held in place by a gauge from the side forms was kept over the center joint, until the first passage of the mechanical tamper over the fresh concrete. The channel was then moved ahead to hold the center joint in line, while the mix was being spread around it.

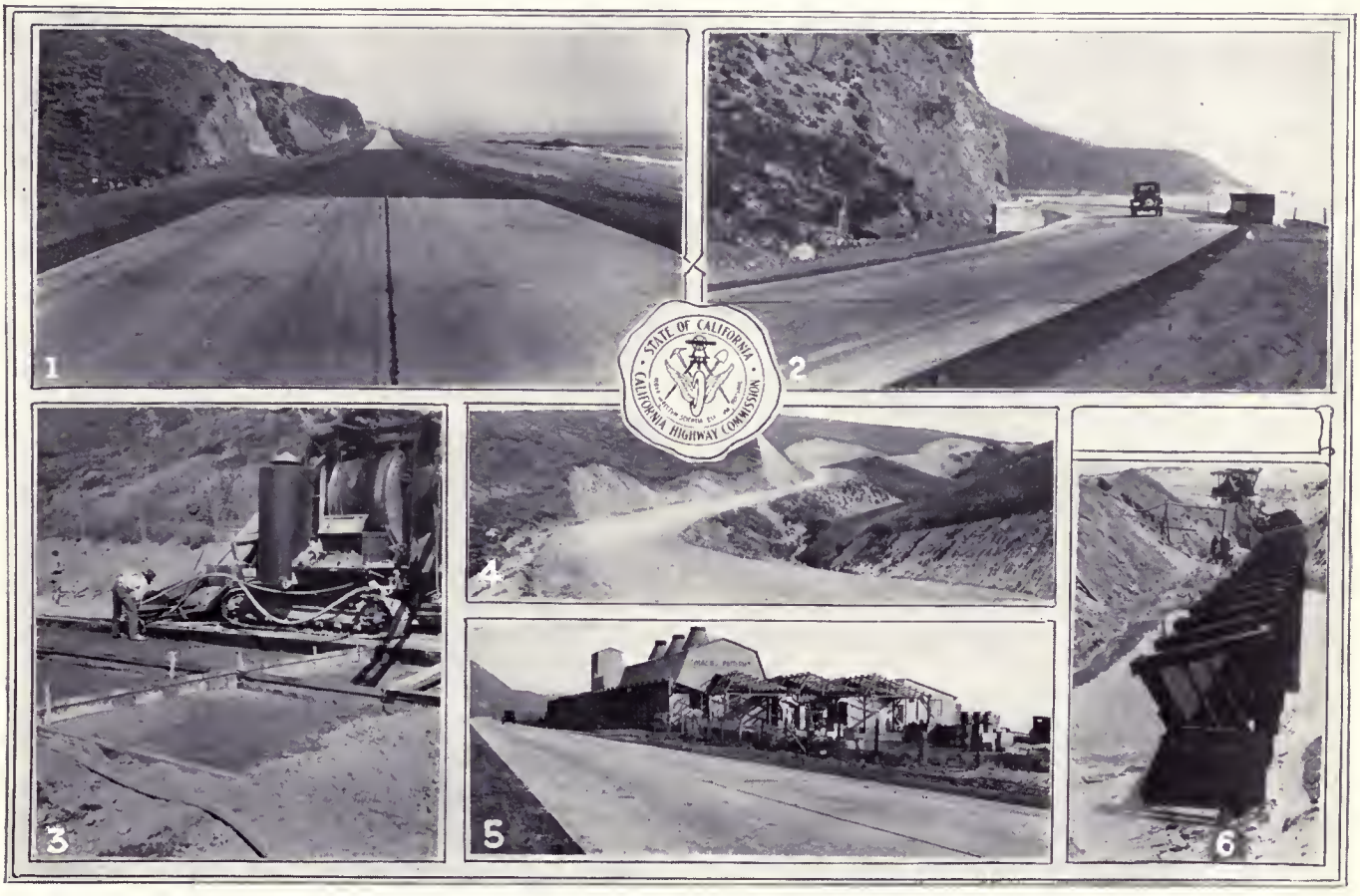
The first practice was to support the center joint from beenath with a small block of wood under each end, care being taken, by means of a gauge extending over the top of the side forms, to keep the top of the joint uniformly ½ inch below the surface of the pavement. It was found, however, that, by supporting the metal plate at two intermediate points, spaced equally through the 15-foot length, the alignment of the joint was greatly improved. (Note: This type of longitudinal joint is *not* standard California practice.)

EMBANKMENT PROTECTION. High seas during spring storms carried away considerable embankment at Rattlesnake Point, and between Malibu wharf and Malibu Creek there was an encroachment upon the grade for a distance of 600 feet. In places the embankment was washed away as far back as the center line.

Some 8000 tons of rock were used for riprap protection at these points. A supply was secured from a large face of hard rock discovered about a quarter of a mile from Rattlesnake Point. Rock was blasted down and loaded on trucks with a power shovel for moving to points where needed.

New Type Bulkhead Designed.

Test pits sunk along the exposed sections showed a layer of closely packed boulders beneath the beach sand, which made driving of piling for an ordinary bulkhead impossible. To meet the situation a box-like structure, 8 feet wide at the base and 7 feet wide at the top, with a V-shaped front wall facing the ocean,



CONSTRUCTION VIEWS ALONG THE MALIBU, LOS ANGELES COUNTY—(1) Low tide, south of Corral Canyon, new concrete pavement with oil macadam exception over fill; (2) new pavement and bridge at Carbon Point; (3) construction view showing method adopted for holding center and expansion joints in place; (4) newly graded section looking north from Walnut Canyon; (5) pottery industry established since building of the highway; (6) forms in place for building of bulkhead on beach near Malibu Creek to provide protection for roadway. (Photos by Division VII.)

Transverse Joints.

Transverse joints were provided every 100 feet with the exception of the first mile, in which, for experimental purposes, joints were placed at intervals of 30 feet. The 30-foot intervals have joints ½ inch wide, while the 100-foot intervals have a ¾-inch joint, supported by ¾-inch by 5-foot dowels. (Note: Present practice specifies 24-inch dowels.)

Concrete after being deposited on the subgrade was struck off and tamped with a Lakewood machine, finishing over all joints. The transverse joints were cut through and edged after the finishing operation was completed, thus insuring a smooth riding surface. The center joint was allowed to form its own crack above the steel plate, but the transverse joints were edged with a 3-inch double edger. A 6-inch edger was used along the side forms.

CURING. For curing, burlap strips were used until the pavement was sufficiently hardened to withstand pressure of an earth cover. Water for curing as well as for the mixer had to be piped from a Los Angeles city supply at a point three miles north of Santa Monica.

was designed. This structure, built of creosoted timbers bolted together, as shown in the illustration, was filled with boulders and sand. (Further details may be secured from the division office.)

Negotiations are now pending for the acquisition, by the commission, of the quarry site near Rattlesnake Point from which rock may be secured for future protection work along this section of the highway.

STRENGTH TESTS. The compressive strength tests of concrete samples from this project, made by the commission's testing laboratory at Sacramento, maintain the high record of recent California pavement. **The average breaking point of 59 test cylinders broken at twenty-eight days was 5027 pounds per square inch.** The standard California requirement of six sacks of cement per cubic yard of concrete was used.

Remarkable Smoothness Record.

VIALOG RECORD. For smoothness, the Malibu paving project holds the record for California, according to a letter received by Division VII from the office of C. S. Pope, con-

(Continued on page 12.)

DISTINCTIVE DONEY CREEK BRIDGE NOW OPEN TO TRAFFIC

THE second of three large arch bridges which are an important feature of the reconstruction of the Pacific highway through the Sacramento Canyon—the bridge across Doney Creek—has been completed and opened to traffic. The structure, which is located in the vicinity of La Moine, Shasta County, not only shortens the distance to be traveled in the canyon, but contributes as well to the safety of the highway by making possible abandonment of a number of dangerous curves and grades.

The third of the three structures—the Harlan D. Miller bridge across the canyon of Dog Creek—is now in course of construction and should be finished by the middle of next summer.

Department Describes Structure.

The bridge department of the California Highway Commission, which designed and is supervising the construction

Construction view, Doney Creek bridge, Sacramento Canyon.

of all three bridges, has furnished the Bulletin with the following description of the structure at Doney Creek:

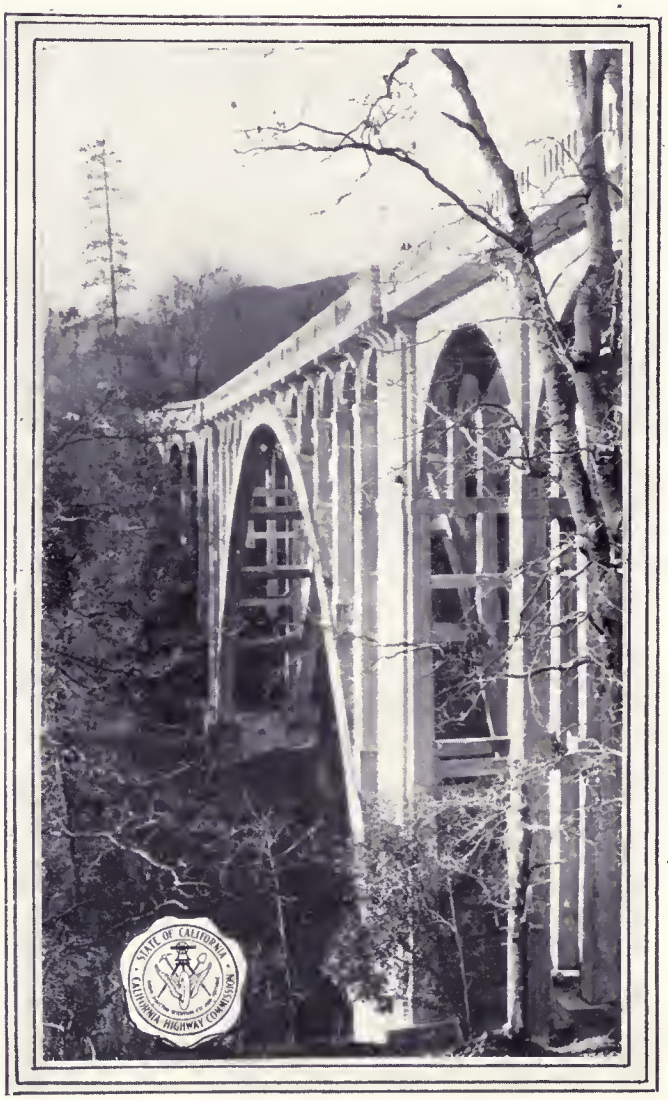
> Doney Creek Bridge is the second largest of the three to be built in the Sacramento Canyon. It has a span of 175 feet and a theoretical rise of 70 feet. The distance above the bottom of the canyon, however, is 120 feet. The arch is an open spandrel, two-ribbed design with spandrel columns spaced on 14-foot centers. There are four approach spans on the south end and five on the north, of 33 feet each, making the overall length of the bridge 499 feet. Its clear roadway width is 24 feet.
>
> The main arch spans on a tangent between two curves of 500 feet and 1500 feet, respectively, which afford the traveler a view of the structure while approaching it. The entire bridge is built on a 540-foot vertical curve which conforms to the road grade.

Site Ideal for High Arch.

> Because of its steepness and outcrops of rock, the canyon in which the bridge is located an ideal site for an high arch. Closeness of the rock to the surface permitted the use of a foundation pressure of eight tons per square foot and accordingly small abutments and footings. On account of the large rise, a comparatively small rib section was required. The arch ribs have a depth of three feet, and six feet, at the crown and spring, respectively, and a width of four feet.
>
> The standard highway loading of two fifteen-ton trucks, or the equivalent uniform live load, was used in the design. Unit stresses are 750 pounds per square inch for the slabs, stringers and floor beams, and 800 pounds per square inch for the arch ribs, which includes dead load, live load, impact, temperature and arch shortening stresses. To provide for the considerable variation in temperature in this section of the state, the ribs were designed for a 30 degree F. rise and a 50 degree F. fall in temperature.

The design of the Doney Creek structure harmonizes with its surroundings, and its position overlooking the Southern Pacific railroad, along the river at the bottom of the canyon, provides the traveler with views of mountain and stream that will add to the pleasure of a trip over this section of the state highway.

Bordwell and Zimmerman of Napa were the contractors. The bridge department was represented by W. H. Johnson as resident engineer. The contract was awarded on March 17, 1926, and was ready for acceptance early in the present month. The cost of the structure will be approximately $83,000.



Completed structure, Doney Creek arch on Pacific highway, Shasta County.

FOREST FUNDS BUILDING TRUCKEE-TAHOE HIGHWAY

THE history of the Truckee-Tahoe City road goes back through the years to the days of immigrant trains, ox teams, and the mad scramble for California gold. Its beginning, like that of many of the pioneer trails, antedates county records, but it appears that for a itme it was a toll road. It was in 1915 that it was included in the state highway system as a part of the Donner Lake to McKinney's state road, authorized by a special act of the legislature.

In 1917 the road came under the jurisdiction of the California Highway Commission. Its crooked alignment and narrow width, however, made it impossible to maintain it as an acceptable roadway for the greatly increased traffic of recent years to and from Lake Tahoe.

Improvement of the section from Truckee to Tahoe City as a Forest highway project was suggested to the Forest Service and the Bureau of Public Roads by State Highway Engineer R. M. Morton. It was put forth as an ideal project for expenditure of Forest funds, and, following its adoption, surveys were started during 1924. It is located in Division III.

Work has been under way during the construction season of 1926, the contract for thirteen miles of grading having been awarded by the bureau to Isbell Brothers of Fresno. A major portion of the rough grading already has been completed and the end of 1927 should see completion of the project. Several bridges, a grade separation, and considerable surfacing, however, are yet to be placed under contract, but plans are being made ready for bids.

Young Brothers have completed the base course of surfacing on four miles near Tahoe City.

High Standards on New Work.

The Bureau already has expended approximately $200,000 of Forest funds on this project; the total expenditure may reach $350,000 when the work is completed.

The new Truckee-Tahoe City highway will be about a mile shorter than the present route. It is being built on high standards of alignment and grade, eliminating the sharp turns and steep pitches of the present road. A connection with the Sacramento-Reno trunk highway will be made at Donner Creek about a mile west of Truckee, where an underpass will be constructed under the main line tracks of the Southern Pacific. All grade crossings of the Lake Tahoe branch of the Southern Pacific, in the Truckee Canyon, except one, will be eliminated by relocation of the existing road. The remaining crossing will be removed by a reinforced concrete bridge that will span both the Truckee River and the railroad.

An order directing construction of the underpass at Donner Creek already has been issued by the State Railroad Commission upon application by the Highway Commission.

The State is assisting with the project by handling the application for the subway and in the securing of deeds for right of way. Condemnation has been necessary in only one or two instances and a court order of possession for these parcels already has been obtained. This work has been done by Division III cooperating with the legal department.

FOREST HIGHWAY—View on new Forest highway under construction by the Bureau of Public Roads between Truckee and Lake Tahoe, in the Tahoe National Forest, Division III. The route is a part of the State highway system.

By the end of another summer, motorists will have a splendid, safe, high-speed highway from Truckee to Lake Tahoe. It will add to the comfort and pleasure of this drive through a section of the beautiful Tahoe National Forest, while at the same time lessening the time necessary for the trip.

CIVIL SERVICE ANNOUNCES EXAMINATIONS FOR ENGINEERS

THE Department of Civil Service has fixed February 15th as the final date on which to receive the applications of those who wish to take examinations for engineering positions in the state service. The examinations to be given include the following classifications:

Junior Construction Engineer, Bridges, Grade 3.
Assistant Construction Engineer, Bridges, Grade 4.
Junior Designing Engineers, Bridges, Grade 3.
Assistant Designing Engineer, Bridges, Grade 4.
Associate Bridge Engineer, Grade 5.
Associate Highway Engineer, Grade 5.

Examinations for Assistant Bridge Engineer, Grade 5, and Assistant Highway Engineer, Grade 5, will be entirely oral and will be given by a board of examiners composed of experienced engineers and executives appointed by the Civil Service Commissioner. The other examinations will be partially written and partially oral. The required minimum rating for all examinations is 70 per cent.

Application blanks may be secured at room 116 State Building, San Francisco; Room 1007 Hall of Records, Los Angeles; or Room 331 Forum Building, Sacramento; or by writing to the headquarters of the commission at the last named address.

The date on which the examinations will be held will be announced later. The closing date for all applications, however, is February 15th.

Mechanics Examinations.

The Civil Service Commissioner also announces that applications are now being received for examinations to be held at various times throughout 1927 for positions in the general metals, mechanical and automotive trades, including the following:

Mechanics' Helper, Grade 1 (all classes).
Mechanic, General, Grade 2 (skilled or journeyman).
Mechanic, Automotive, Grade 2 (skilled or journeyman).
Foreman Mechanic, Automobile, Grade 3.
Truck Driver, Heavy, Grade 2 (skilled or journeyman).
Tractor Operator, Grade 2 (skilled or journeyman).

For details as to these examinations information may be secured by writing to the State Department of Civil Service at 331 Forum Building, Sacramento, or by application at its San Francisco or Los Angeles offices.

DIVISION VIII MEETS EMERGENCY CAUSED BY FLOODS

AFTER THE STORM IN DIVISION VIII—(1) Crew building temporary road at washout in Meyers Creek Canyon, western Imperial County; (2) terrific force of cloudburst undermined pavement to great depth at many places; here a block of concrete has fallen into the gully cut below; (3) Meyers Canyon where a section of two miles of pavement was entirely destroyed; undermined pavement at right; (4) the unprecedented flood clogged culverts and washed away shoulders and embankments; no culverts were adequate to carry the flood waters; (5) destruction of concrete pavement at approach to San Diego and Arizona railroad underpass on the Borderland highway; a section of the railroad also was washed away; (6) flood across highway in Riverside County, between Indio and Edom; (7) hastily gathered crew begins construction of temporary bridge across San Felipe Wash, part of original bridge not swept away is being dismantled to provide timbers for temporary structure; the flood completely covered the highway bridge, cutting away the banks at either approach.

DIVISION VIII had an opportunity to demonstrate the efficiency of its maintenance forces, when early in December unprecedented floods caused serious damage to state highways in Imperial and Riverside counties, on the northern and western entrances to Imperial Valley. Reports indicate the emergency was splendidly met, and that, considering the circumstances, there was a minimum interruption of traffic.

Torrents of water which carried away bridges and entire sections of pavement were caused by great cloud bursts in the Laguna Mountains. These cloud bursts followed several days of rain, which already had thoroughly saturated stream beds of the desert washes.

To the northward of El Centro, there was some damage as far as Edom, Riverside County. To the westward, the damage extended to the Mountain Springs grade, where numerous slides delayed paving operations. At the foot of Meyers Canyon, at the westerly line of Imperial County, two miles of cement concrete pavement and grade were destroyed by the terrific force of the flood in Meyers Creek.

Bridge Carried Away.

The most serious interruption of traffic began on December 9th at San Felipe Wash, on Route 26, in northern Imperial County. San Felipe River, swelled to a raging torrent, destroyed nine of the twenty spans of the highway bridge crossing the wash. Even the pile bents of the destroyed spans were washed away. On nearby sections, at many points, water poured over the pavement for hours, doing extensive damage by causing deep erosion of shoulders and embankments and undermining of the pavement slab. At other places deposits of mud and sand covered the pavement to a depth of several feet.

The San Felipe bridge went out on the night of December 9th. By mobilizing all available maintenance foremen and crews, Division Engineer E. Q. Sullivan succeeded in building a crossing for light traffic which was in use on December 12th. A procession of vehicles, three miles long, was waiting to move northward when traffic was resumed. As soon as the pavement could be cleared for the movement of lumber, a heavier crossing for truck traffic was provided. To make this possible maintenance forces worked night and day to clear the pavement of debris washed down from the mountains. Stranded motorists were employed to augment state maintenance crews.

An emergency contract for the rebuilding of the San Felipe bridge was awarded by the commission at its meeting in Sacramento on January 3d.

Relocation Studies Under Way

The mose serious damage to pavement was wrought by the flood in Meyers Canyon, just east of the San Diego County border, on Route 12. An oil cake detour road has been built through the

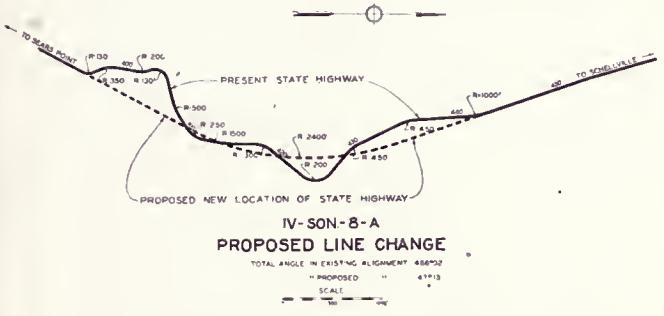
(Continued on next page.) Ten

LINE CHANGE ON BLACK POINT CUT-OFF TO REMOVE CURVES

DIVISION IV has completed plans and has secured necessary right of way for an important line change on the Black Point cut-off near Fairville, Sonoma County. One curve with a 2400-foot radius, with long tangents at either end, will be substituted for twelve curves on the present line, several of which are blind and two of whch have a radius of only 130 feet. The commission, at its meeting on January 24th, authorized a call for bids.

The outstanding features of the proposed change over the present alignment are shown by the following comparison:

Total length of present line	4882.98 feet
Total length of proposed line	4378.70 feet
Total reduction in length	504.28 feet
Total curvature of present line	466° 02 feet
Total curvature of proposed line	47° 13 feet
Total reduction in curvature	418° 49 feet



Grades of the new line are equally as good, if not better, than those on the existing highway. The road on either side of the proposed change has good alignment, and with the completion of the proposed improvement the alignment of the entire section may be considered above the average, the Division reports.

DIVISION VIII MEETS EMERGENCY

(Continued from page 10.)

wash around the 2-mile washout, and studies are now being made to determine the best location for the rebuilding of this section. The division has a survey party in the field and the situation has been gone over personally by the Engineer of Surveys and Plans. It is probable that a new location will be adopted for a part of the distance.

Maintenance Engineer T. H. Dennis reports emergency maintenance allotments for Division VIII, because of the floods of December, will total approximately $27,000. A preliminary estimate of the amount necessary for reconstruction of destroyed sections of highway is placed at $100,000 by Fred J. Grumm, Engineer of Surveys and Plans.

As indicative of the way in which the emergency was handled by the division, the following is quoted from a letter received from W. R. Conway, proprietor of the Hotel Barbara Worth at El Centro.

> "I wish to acknowledge my appreciation of the asssitance rendered me last week by your road men during the tie-up when I was delayed out on the desert, and to thank your organization for the consideration and help extended. They did all possible and I certainly appreciated as never before the credit due your commission for the work they are doing."

"I bought a radio set to try to keep my children indoors."

"Was it a success?"

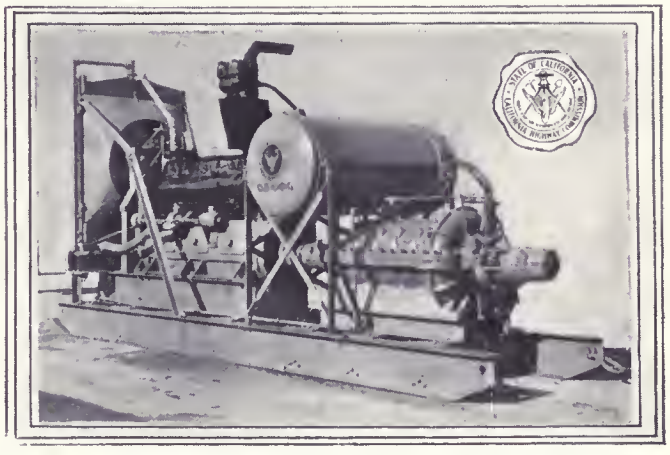
"Not altogether. They now stop indoors until the announcer calls 'Good night, everybody.'"—*Pele Pele,* Paris.

SHOP ASSEMBLES PRESSURE PUMP FOR HYDRAULICKING SLIDES ON THE REDWOOD HIGHWAY

THE Headquarters Shop has just completed the assembling of a high-pressure multi-stage centrifugal pump for use in hydraulicking slides on the Redwood highway in Division I. This outfit has a capacity of 400 gallons per minute against a total head of 462 feet. During a recent test at the Headquarters Shop, a 1¼-inch stream was thrown nearly 300 feet.

The outfit is made up of a six-cylinder 130-h.p. Sterling marine engine received from the United States government some years ago, a 4-inch six-stage Dean-Hill multi-stage centrifugal pump, and a radiator removed from an old Holt 15-ton tractor which was received from the government several years ago and wrecked for parts. The pump and engine are mounted on skids so as to be easily portable.

The shop also has assembled a single-stage centrifugal pump outfit as a feeder for the multi-stage pump. This outfit was made up of one of the Cadillac engines received from the



High pressure pump for hydraulicking slides on the Redwood highway; assembled at Headquarters Shop, Sacramento.

government some years ago, a tractor radiator, and a 4-inch Byron-Jackson centrifugal pump having a capacity of 450 gallons per minute against a total head of 100 feet.

Division Develops Plan.

The feeder pump is necessary because the state highway at many places is at a considerable elevation above the nearest available water supply. Too much of the pressure would be consumed if the multi-stage pump were placed at the lower elevation. Also the larger pump is so much heavier and more cumbersome than the single-stage pump, that it is easier to get the latter down to the water.

Removal of slides by hydraulicking, it has been found by experience, is the most efficient and economical means to employ in many localities along the Redwood highway. This plan of slide removal has been developed to a considerable extent during recent winters by Division I.

CIVILIZATION AND ROADS.

You hear people say that civilization rests on the home, the school, the courthouse, or the church, but how about roads?

Isn't the ability to move about, to exchange goods and ideas, the real secret of human progress?

A genius can be born in the desert, just as a clock can strike in the forest, but what good does it do?

The courthouse stands at the center of the town, the school and church by some main highway, and no man builds his home far from a road if he can help it.—*Georgia Highways.*

NEW REEDS CREEK BRIDGE HAS STATE'S LONGEST GIRDER SPANS

THE new Reeds Creek bridge, which provides a handsome Pacific highway entrance to Red Bluff from the south, is distinguished in that it has the longest concrete girder spans ever built by the California Highway Commission. In designing this structure, the Bridge Department provided for three two-girder spans, each 70 feet in length, making the total length of the bridge 210 feet. The long spans necessitated deep girders extending 8 feet 6 inches below the surface of the roadway. Large panels in the girders, together with cantilevers for sidewalks, give a pleasing elevation.

The bridge has a clear roadway width of 24 feet, and, in addition, a five-foot sidewalk has been provided on either side.

Reeds Creek bridge, Tehama County; note deep girder design and sidewalks on either side of roadway.

The Bridge Department was represented by M. J. Dwyer as resident engineer. The contractor, the Holdener Construction Company of Sacramento, began operations during the latter part of the summer. Work was completed early in January and the bridge is now open to traffic.

The cost, which was approximately $31,000, was divided between the state, Tehama County, and the city of Red Bluff.

MALIBU PAVING PROJECT

(Continued from page 7.)

struction engineer. The vialog test showed only 4.1 inches of roughness per mile.

This remarkable record of smoothness and high strength well repay the engineer for his efforts to meet the trying situations encountered on this job. In this connection the writer wishes to give full credit to his assistants: Assistant Resident Engineers, J. M. Lackey, J. P. McAndrew, R. P. Lapp, and R. H. Rowe. When additional funds become available, it is hoped future pavements on this important highway will be equally as good or better.

ORIGINAL.

She: "Now what are you stopping for?"
He (as car comes to halt): "I've lost my bearings."
She: "Well, at least you are original. Most fellows run out of gas!"

TRAFFIC PROBLEM SOLUTION NOT A DETRIMENT TO DIXON

(From the Livermore *Herald.*)

THE crossing problem at Dixon, regarding which we have heard considerable since the tragedy of some weeks ago, is to be solved by the State Highway Commission through the establishment of a new route which parallels the railroad tracks and eliminates the two grade crossings. This new route will not pass through the business section of Dixon, and the town is inclined to feel that it will suffer through loss of business when the traffic is diverted away from its principal street.

Dixon should consider itself forutnate in the plan devised by the commission as whatever loss there may be will be offset many times over by the removal of through traffic from its streets. The situation is almost exactly the same as in Livermore, except that here the highway was never routed through town and from the start gave us the go-by, two grade crossings being thus eliminated and a more direct route secured, as will be the case at Dixon. We have lost some business, undoubtedly. But even so our streets have more traffic than they can carry comfortably and the situation is daily growing more unsatisfactory. Furthermore, a new business section of the type catering to auto traffic has grown up at the junction of the highway and the streets leading into town, which takes care of business main street stores lose. Dixon may expect a similar result.

The highway system of the future will find great trunk roads connecting the big cities by as direct routes as possible and missing most of the smaller towns, such as is planned for the highway down the west side of the San Joaquin Valley. Livermore and Dixon and other similarly situated communities will still find that they have all the auto traffic they can take care of with the tremendous growth in the use of the automobile which is increasing every day and with the saturation point expected but seemingly never reached.

BRIDGE DEPARTMENT COMPLETES STRUCTURE FOR CITY OF WILLITS

The Bridge Department of the California Highway Commission, acting for the city of Willits, Mendocino County, has just completed the construction of a reinforced concrete bridge across Broaddus Creek. The structure, which is located on the Redwood highway within the city limits, was financed by the municipality.

The bridge consists of three twenty-eight-foot spans. It has two eight-foot sidewalks and a clear roadway width of forty feet. Plans were prepared and construction supervised by the Bridge Department at the request of the municipality. W. S. Kingsbury, Jr., was resident engineer.

Proctor and Cleghorn were the builders and the cost was approximately $11,000.

ON COAST ROUTE—Section of new "second-story" cement concrete pavement on Coast highway near Oceanside, San Diego County. Jahn and Bressi, contractors.

AGREEMENT APPROVED FOR SERRA GRADE SEPARATIONS

THE State Railroad Commission has approved the agreement entered into by the California Highway Commission and The Atchison, Topeka and Santa Fe Railway Company for the construction of two subways at Serra, Orange County, at the junction of the Oxnard-San Juan Capistrano coast highway with the Los Angeles-San Diego trunk route. It is expected that bids for the grading will be asked in the near future. The Commission, on January 3d, signed an agreement with the railroad company for building of the under passes. Steel has been ordered and actual construction is expected to start by February 15th.

The project involves a notable change in the line and grade of both the State highway and the railroad, which is shifting its tracks to make possible a safe junction of the two State highways. The present 200-foot curve in the Los Angeles highway will be increased to one of 550-foot radius, superelevated. This will be made possible by cutting down the bluff at this point, the excavated material being used by the railroad company to raise the grade of its tracks.

The shifting of the location of the railroad and a raise of nine feet in the grade will greatly facilitate construction of the two subways. These will be built of steel and concrete and will each have a clear roadway width of 40 feet. The curve leading through the south subway, in the direction of San Diego, will have a radius of 750 feet, and the one leading northward toward San Juan Capistrano will have a radius of 900 feet, as shown in the illustration.

Necessary for Traffic Safety.

Two subways at this point were determined upon because of the heavy traffic over the Coast highways, which must be properly cared for at this junction to obviate dangerous congestion.

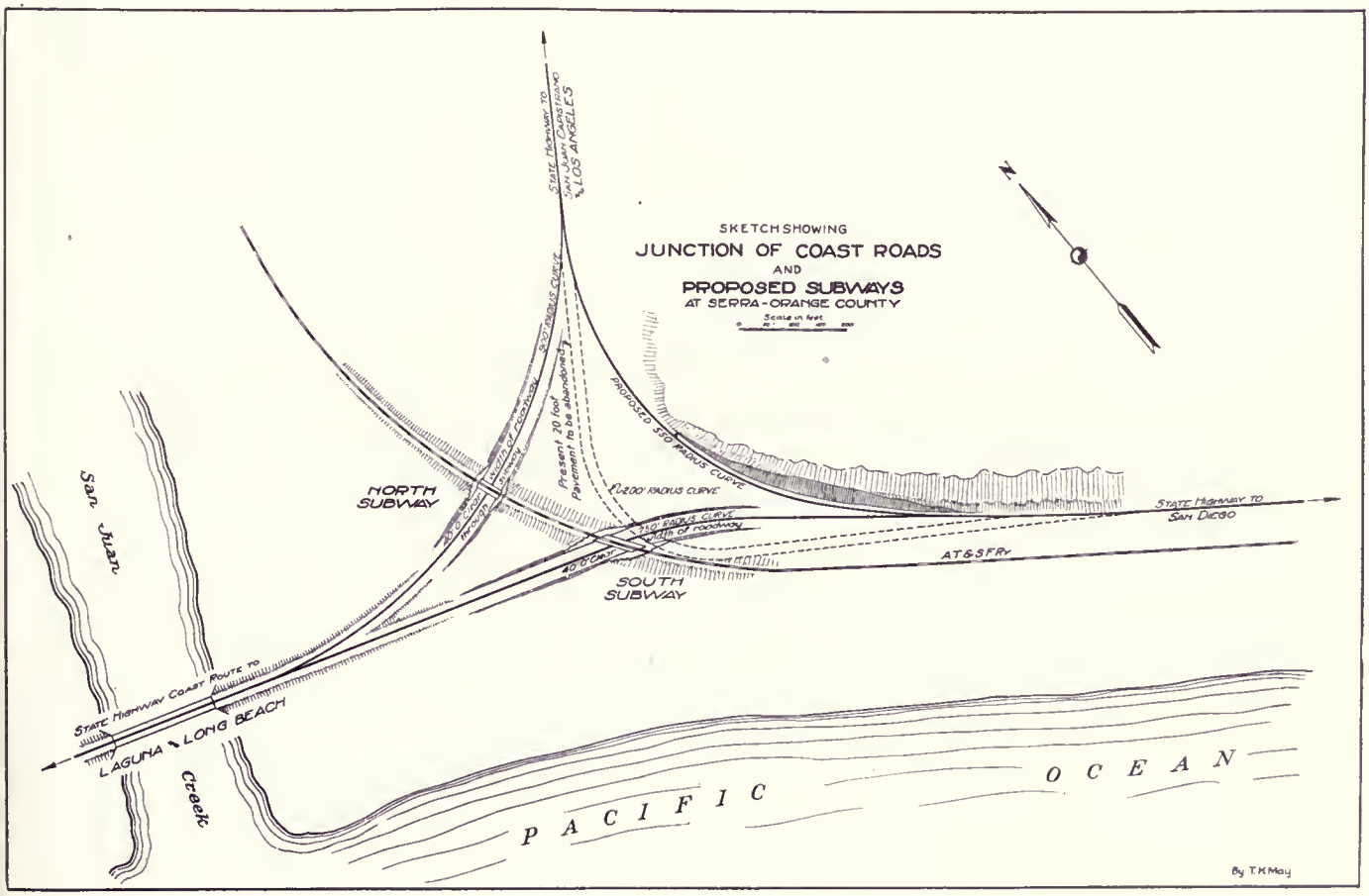
The agreement between the Commission and the railroad company, as approved by the State Railroad Commission, is as follows:

(a) The Highway Commission shall bear 60 per cent and the railway company 40 per cent of the cost of the North bridge.

(b) The Highway Commission shall bear 75 per cent and the railway company 25 per cent of the cost of the South bridge, including foundation, excavation, concrete abutments, steel span, docking for span, and all necessary labor incidental thereto.

(c) Each party shall pay 50 per cent of the cost of all track work and the necessary grading for the change of the line of railroad and all other work incidental thereto.

Material cooperation was extended by Orange County, the road department of which secured considerable necessary right of way at Serra.



He was just a plain, ordinary surveyor with a transit—a small telescope mounted on three legs, through which he peered to see if the cornerstone was eight inches inside the line or $4,000 outside.

A bilious individual with a heavy breath stood and watched him as he lined up the Mission district and made little marks in his pad. Finally the tanked one approached, and after fumbling in his pockets brought out a not too clean nickel.

"Here, feller," he said. "Le's see 'em."

"See what?" asked the surveyor.

"The eclipses . . . that's wha'cher lookin' at, ain't it?"

WHAT THE DIVISIONS ARE DOING

DIVISION VII MAKES GOOD WITH GOLD DOLLAR FOR RIGHT OF WAY

IN EASTERN San Diego County, on the highway between San Diego and El Centro, is the desert oasis of Mountain Springs. It is the only water supply in miles and in all probability was a famous place among the Indians long before the days of the padres. In Mexican war times it was the headquarters for troops of General Fremont and General Kearny, who were engaged in opening up a military road through the mountains to provide a more direct route from Fort Yuma to San Diego.

The seven-mile grade from Myers Creek to the summit passes through the springs and takes its name from them. The grade forms a part of the State highway and has been under improvement by Division VII for several years. First it was widened and straightened, and now paving is in progress.

Line changes required some additional right of way through Mountain Springs, and the division entered into an agreement with

DOWN NEAR THE BORDER—View of Mountain Springs, San Diego County, where paving operations are under way on Borderland route. *Inset,* L. M. Ransom of Division VII handing J. E. McDonald a gold dollar in exchange for deed to right of way through Springs property.

J. C. McDonald, the owner, to make the purchase for one dollar, "gold coin of the United States." When the time came for delivery of the deed, McDonald insisted on receiving his dollar in gold. Following its usual procedure, Division VII made good.

The search for a good dollar was taken up by Assistant Division Engineer L. M. Ranson. Visits to a number of Los Angeles jewels and pawn shops were without avail; then a friend in a bank sent him to a coin collector, from whom, for $3.50, Ranson purchased a United States gold dollar of 1853 coinage. With due ceremony the dollar was delivered to McDonald, and the state took the deed to the needed right of way.

After it was all over Ranson learned that the resort owner formerly was a publicity man in Chicago, which explained everything. The 1853 dollar is now on display at Mountain Springs along with a collection of guns, canteens, uniform buttons and other souvenirs which have been found in the vicinity, and which are evidences of the use of the place by Fremont's soldiers, the first road builders of the early days of American sovereignty.

As the only residents in many miles, Mr. and Mrs. McDonald are cooperating in a most friendly way with the engineers of Division VII in their efforts to improve the Borderland highway.

SNOW REMOVAL ACTIVITIES

THE regular maintenance crews, who are trained for the work, are available night and day to remove snow in Division II, reports H. S. Comly, division engineer. The division at the present time is engaged in snow removal work at five places on the Redding-Alturas lateral; between Montgomery Creek and Burney; over Burney Mountain; over Big Valley Mountain, between Pittsville and Bieber; on Adin Summit, between Adin and Canby; and also over Cedarville Summit, east of Alturas.

Light equipment and graders, which start operations as soon as snow begins falling, are used unless the snowfall becomes exceptionally heavy, when the lighter equipment is supplimented by heavier tractor plows of the push type.

Such equipment is also in readiness at all times for action on the Pacific highway in the vicinity of Mount Shasta City, Division II, where removal is sometimes necessary.

Southern California Also.

Division VIII, with headquarters in San Bernardino, is the only other division carrying on a snow removal campaign of any magnitude. Strenuous efforts have been made by Division VIII to keep the state highway leading to Arrowhead and Big Bear lakes, in the San Bernardino mountains, open for motor traffic. Heavy equipment has been necessary for this work.

DIVISION VII.

HEADQUARTERS, LOS ANGELES.

S. V. CORTELYOU, DIVISION ENGINEER.

Counties of Los Angeles, Ventura, Orange, San Diego, and eastern Kern, south of Mojave.

ASSISTANT Superintendent of Maintenance A. W. Schmuck, in charge of the camp at Point Mugu, is operating two gas shovels and a fleet of dump trucks for placing of riprap rock and removal of slides along the 6.5 mile stretch of coast highway, in Ventura County, between the point and the westerly boundary of the Rindge Ranch. Riprap rock for protection of the highway embankment from ocean waves is being quarried at various places along the highway.

Concrete pipe culverts along this section recently were provided with half-round corrugated metal pipe extensions, designed to carry the drainage clear of the embankment. Headwalls have been omitted on this section to permit easy lengthening, by adding sections of concrete pipe, should wasting of slide material and subsequent widening of embankments make it necessary.

The half-round corrugated metal pipe extensions are of commercial size, having a diameter which corresponds as nearly as possible to the outside diameter of the concrete pipe. They are slipped under the end of the culvert and are held in place with an half-inch iron ring clamp, painted with asphalt. The extensions are supported with one or more stake saddles, depending upon their length. Cement mortar is used at the connection to prevent water from getting back under the concrete pipe.

Progress on Tustin Contract.

Good progress is being made on the paving contract of the Griffith Company from the easterly city limits of Santa Ana to Tustin, Orange County. Public utilities, poles and pipe

lines have been moved and trees taken out to clear the way for widening of the pavement. Curb and gutter construction is well under way and preparations are being made to place the 56-foot concrete pavement.

A rainfall of 14 inches in 36 hours, recorded at Boulder Park at the top of Mountain Springs grade, in San Diego County, caused considerable damage on the Jahn and Bressi

Culvert extension on Coast highway, Division VII, to prevent erosion of embankment.

contract. Several large and many small slides occurred and the roadbed was washed in many places.

Over a mile and a half of concrete pavement, 20 feet wide, has been placed on the Oxnard-Hueneme road cut-off, in Ventura County. Grading of the roadway and installation of culverts has been completed.

DIVISION X.

HEADQUARTERS, SACRAMENTO.

R. E. PIERCE, ACTING DIVISION ENGINEER.

Counties of Amador, Calaveras, Alpine, Tuolumne, Stanislaus, San Joaquin, Solano, and southern Sacramento and Yolo counties.

WORK of widening the Sonora-Salida lateral from Salida easterly to the McHenry road, a distance of five miles, is proceeding as rapidly as weather conditions will permit. The work is being done by the Valley Paving and Construction Company, as an extension of the contract for widening the state highway from Modesto north to Stanislaus River. The existing paving is a 12-foot concrete slab, 4 inches thick, built about eleven years ago. It is being widened to 20 feet by placing on either side shoulders of asphaltic concrete, 4 inches thick, the entire width to be covered with a top wearing surface of asphaltic concrete.

Two concrete culverts also are being lengthened in connection with the widening work.

HIGHWAY NEWS NOTES

F. E. QUAIL, for many years County Surveyor of San Joaquin County, is now an assistant engineer with the Headquarters maintenance department under T. H. Dennis. He has been placed in charge of field inspection.

Rodney Messner, formerly resident engineer on the state of Division IV, is now County Surveyor of Marin County, an office to which he was elected on November 2d. He based his campaign on his record of service with the California Highway Commission.

R. A. Allen, superintendent of equipment, Shop 8, San Bernardino, has been transferred to Redding to take charge of Shop 2. He succeeds I. H. Sanford, resigned.

SHOVEL OPERATOR RISKS LIFE

A POWER shovel operating on the coast highway near Point Mugu, Ventura County, Division VII, was buried recently by a slide, but not until Shovel Operator Dewey Alderson had made a strenuous effort to move the equipment to a place of safety.

The shovel was being operated on slide removal work by the maintenance crew of Superintendent A. W. Schmuck, when a slide was observed starting down the mountain side. Instead of jumping from the cab, Alderson put the machine into reverse and held the governor open, but the great mass of earth and rock was upon the shovel before it could be moved far. Alderson's foot was wedged fast when the side of the cab was caved in, but he was not seriously injured.

The attempt to back the shovel away prevented it from being completely covered with earth and rock. Five minutes later, the second shovel on the job was on its way to dig its companion out. The two shovel operators, taking turns at the control, worked all night to clear away the debris, and in twenty-four hours the damaged machine was released and was being partially dismantled for repairs, which were completed within three days.

The report of Superintendent Schmuck commended Shovel Operator Alderson for his effort to protect the equipment.

Shovel buried by slide while in operation near Point Mugu, Ventura County. *Inset,* Shovel Operator Dewey Alderson who risked life in effort to save equipment.

AMENDED VERSION.

Show me a paved road home,
I'm tired and I want to go to bed.
I just drove to town 'bout an hour ago,
In mud clear to my head.

Everywhere I roam,
Through sand and mud and loam,
You'll always hear me singing this song,
Build me a paved road home.

—*Nation's Highways.*

Willis D. Cook has assumed his former position as superintendent of Shop 8, succeeding Mr. Allen.

E. S. Anderson, superintendent at Shop 6, Fresno, has resigned and has been succeeded by John M. O'Malley.

R. E. Pierce, acting division engineer, Division X, returned to the office on January 3d, after a vacation spent with relatives in San Diego and Los Angeles. Mr. Pierce was much impressed with the splendid work accomplished during the past year on the Ridge Route and on the highway between Los Angeles and San Diego.

STATE HIGHWAY FUND CONTRACTS (Bond Funds, Including Federal Aid)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE DEC. 15, 1926.						
479	VII	Orange	60	A, B	Newport Beach to Laguna Beach	9.78	4 mi. P.C.C. Pave. and 5.78 mi. Asph. Mac. Pave.	Kavanagh and Twohy	$222,535 69	Aug. 14, 1925	------
497	I	Del Norte	1	C	Across Smith Riv. 1 mi. west of Adams Sta.	------	Concrete Arch Bridge	Smith Brothers Co.	44,183 36	May 7, 1926	------
502	VIII	Imperial	26	H	New River, Tamarack and Trifolium Canals	------	3 Timber Bridges	Norman B. Conway	15,973 31	June 8, 1926	------
504	VI	Fresno	------	------	City of Fresno	------	Division Office Building	Shorb and Neads	18,893 25	June 28, 1926	------
505	VI	Fresno	------	------	City of Fresno	------	Plumbing and Heating for Div. Office Bldg.	Barrett Hicks Co.	3,513 38	June 28, 1926	------
483	VII	Orange	60	C	Laguna Beach to San Juan Creek	7.42	Grading and Rock Surfacing	Chas. G. Willis and Son	239,362 00	Sept. 21, 1925	------
508	II	Tehama	3	B	Across Reeds Creek at Red Bluff	------	Concrete Girder Bridge	Holdener Construction Co.	35,732 25	July 14, 1926	------
					AWARDED SINCE DECEMBER 15, 1926.						
519	VII	Orange	60	B, C	Through Laguna Beach	1.54	Grading and P.C.C. Pavement	United Concrete Pipe and Const. Co.	$70,012 13	Jan. 3, 1927	125
					PENDING AWARD—None.						
					Total State Highway Fund Contracts Awarded and Pending Award	1.54			$70,012 13		

NOTE.—Primary construction covered by the above contract does not include funds obligated on cooperative forest highway projects, prison camp road activities, or day labor jobs not being done under contract.

STATE HIGHWAY MAINTENANCE FUND CONTRACTS (Including Gasoline Tax Fund)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE DEC. 15, 1926.						
M-146	II	Tehama	3	D	Sacramento River Bridge	------	Repair and Paint Bridge	D. E. Burgess	$6,390 00	Sept. 14, 1926	------
M-127	III	El Dorado	11	F	Between 2 miles east of Sportsman's and Riverton	8.56	Grading and Rock Surfacing	Irey and Holden	59,933 59	May 15, 1926	------
M-132	V	Santa Barbara	2	K	Across San Jose Creek	------	Conc. Girder Br. and Pave. Approaches	Mattock and Feasey	11,623 27	June 28, 1926	------
M-134	IX	Inyo	------	------	At Bishop	------	Maintenance Buildings	Grant T. Johnson	16,522 88	July 30, 1926	------
M-136	IV	Marin	1	B	Across Corte Madera Creek at Ross	------	Widening Existing Bridge	McDonald and Maggiora	11,070 00	Aug. 16, 1926	------
M-153	IV	Marin-Sonoma	8	A	At the Petaluma Creek Bridge	------	Pile Fenders and Dolphins	Healy-Tibbitts Construction Co.	11,857 50	Oct. 22, 1926	------
					AWARDED SINCE DECEMBER 15, 1926—None.						
					PENDING AWARD—None.						

NOTE.—The above obligations charged against the State Highway Maintenance Funds do not include funds from these sources obligated for general maintenance and for specific betterments being done under day labor authorization.

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CALIFORNIA HIGHWAYS

A BULLETIN ISSUED BY THE CALIFORNIA HIGHWAY COMMISSION FOR THE INFORMATION OF ITS EMPLOYEES AND THE PUBLIC

Vol. 4 FEBRUARY, 1927 No. 2

Keeping Pacific highway open. Rotary plow in action near Mount Shasta City, Siskiyou County. Equipment in charge of maintenance crew of Division II. See article on page 5.

In this Issue: A DISCUSSION OF COST ACCOUNTING ON DAY LABOR JOBS—GRAPHIC CHARTS AND THEIR USE IN BRIDGE DESIGNING.

MAR -8 1927

CALIFORNIA HIGHWAYS

This Bulletin is published by the California Highway Commission for the information of its employees and the public. Editors of newspapers and others interested are welcome to use, without restriction, any of the matter herein contained. Cuts will be gladly loaned upon request.

FRANK B. DURKEE - - - Editor

P. O. Box 1103, Sacramento, California.

Vol. 4. FEBRUARY, 1927. No. 2

CALIFORNIA HIGHWAY DEPARTMENT

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J. P. BAUMGARTNER, Commissioner, Santa Ana

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E. Q. SULLIVAN, Division VIII, San Bernardino

F. G. SOMNER, Division IX, Bishop

R. E. PIERCE (Acting), Division X, Sacramento

General Headquarters, Third Floor, Strub Bldg., Eleventh and P Streets, Sacramento, California.

EVERY employee of the highway commission has a direct interest in the improvement of the highway organization's methods and results, both engineering and clerical, office and field. To that end, the State Highway Engineer invites constructive criticism or suggestions from every employee.

Ideas as to the more economical and efficient handling of your job, or suggestions for elimination of waste will be welcomed. Criticism is also desired from persons outside the organization, who are in a position to give facts.

Send only signed communications addressed as follows: California Highways, P. O. Box 1103, Sacramento, Cal.

COMMISSION APPOINTS NEW ATTORNEY AND SECRETARY

THE commission, at its meeting in Sacramento on February 23d, announced the appointment of Harry Encell of Oakland, as attorney, to succeed Paul F. Fratessa of San Francisco, resigned. Mr. Encell was formerly in the state service as attorney for the Board of Medical Examiners and is a well known member of the bar.

E. Forrest Mitchell of Belvedere was chosen secretary to succeed W. F. Mixon, resigned. The new secretary has long been active in public affairs and is well known throughout the state. Mr. Mixon, on March 1st, will assume new duties as Secretary of the Yolo County Board of Trade with headquarters in Woodland.

THE AMERICAN ENGINEER

WE MARVEL at the remarkable accomplishments of the engineering profession—the great railway and steamship lines of this country—automobiles and successful commercial airplanes—our massive hydro-electric and other power plants—gigantic irrigation systems—ponderous steel-making and scores of other industrial plants because we can see them—great, massive, throbbing, pulsating things before us.

They are wonderful achievements. That is instantly apparent, but there is a phase of the work of the engineering profession with which the average layman is perhaps not so familiar and to which may be directly traced the present day prosperity of American industry.

It is the constant struggle of American engineers for greater efficiency. The history of the profession fairly bristles with successful accomplishments in this direction.

Present day industries are tremendously interested in any improvement or step which reduces the cost of production or operation and that is where our engineers have made truly remarkable strides.

You enjoy an automobile on a fine paved highway or ride in comfort in a palatial train or steamship or in an airplane and you have countless other comforts at a reasonable cost because engineers have made it possible. We can't measure our indebtedness to them.—*Charles Schwab.*

COOPERATION.

An item in the King City *Herald* tells of the cooperation extended King City by a maintenance crew of Division V. The main street through the municipality was repaired by state forces. Says the *Herald:*

The work done by the highway crew is for the town and the Highway Commission will charge for the labor and materials. The town is able to get it done in this manner much more economically than would be the case if it had to assemble its own materials and crew.

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FEBRUARY 1927

California Highways

VOL. 4 No. 2

Rebuilding State Highways

(An editorial from the Santa Barbara Press.)

"WHY DIDN'T they build it right in the first place and save all this money?" asked a man relative to the hundreds of thousands of dollars being spent upon the state highway east and west of Santa Barbara.

The question is easily answered.* When these roads were first built there was no heavy demand upon them by the traffic—and who could have foreseen ten or fifteen years ago that the automobile would have increased to the extent that it has today?

When the state highways of California were originally built it was thought that if they were wide enough for a car to find comfortable traveling in one direction it would be sufficient. They could pass each other at slower speeds and in safety. A few curves here and there were less costly than tearing away great hills with steam shovels, and it was deemed best to build the roads around the hills and save the money.

But in the last few years the ownership of motor cars has increased so tremendously that it takes a wide roadway—for motorists want to pass at 50 miles an hour and what some motorists want, they get or do, regardless of the safety of others. It has been necessary in the interest of life and limb, to widen the highways so that the fast drivers can pass without killing others who may impede their way. Likewise, a reasonable amount of speed is now considered essential. The automobile is a quick means of travel from one locality to another and if it is to be quick, it must have an open road. Curves and blind corners are dangerous—and they kill time. The curves have to be taken down, the climbs around hills have to be changed to easy grades over hills; trees and shrubbery that obscure certain sections of the road have to be removed, posts protruding even the slightest into the right of way have to be painted white so they can be seen even at night. It costs money but is necessary.

None of the things that are being done now could have been foreseen 15 years ago when the first coast highway was constructed. Where the old pavement is being used for the reconstruction, no money is being lost, for the old pavement is furnishing a foundation for the new, wider pavement, that will last for ages. Where the curves are being taken out and more substantial bridges erected, there is little loss, for the old pavement and the old narrow bridges have served their purposes and given the taxpayers their money's worth in most cases.

In some places in California, particularly in Ventura County, the original light construction has been costly to the people, for the heavy traffic of the past few years, particularly by trucks, has torn up much work that must be rebuilt even before the bonds issued to pay for the first have been paid off. This is a hardship upon the taxpayers, of course. In the case of the state highway construction near Santa Barbara, however, the old work is all paid for and the new construction is being done with maintenance and repair funds paid into the state treasury as a gasoline tax by those who use the roads.

And by the way, when the pavement now being constructed between Santa Barbara and Ventura is completed, one of the finest highways in the world will connect Santa Barbara and Los Angeles, and it should result in bringing hundreds of thousands of additional motor parties to this city within the next few years.

*Editor's Note.—A considerable part of the state highway in Santa Barbara County was built originally by the county and not on state standards. The roads followed pioneer routes and were not conceived as a part of a great system of trunk highways for the increased traffic of today.

A Discussion of Cost Accounting on Day Labor Jobs

By B. W. BOOKER, Office Engineer, Division I.

EXPERIENCE in Division I during the last three years in cost keeping on convict and day labor jobs, has resulted in a system being worked out, that I believe, accomplishes the most important function of cost keeping, i.e., the cost per unit from month to month as the job progresses.

It is a simple matter to obtain and analyze the total cost per unit at the end of the job, and to obtain the total cost of each contract item during the progress of the job. The former cost is, of course, useful, as it gives, at the end of the job, a cost which can be used as a basis for future estimates. It is the "post mortem," necessary and instructive, but made too late to be of any benefit to the job analyzed.

The second cost is worthless and if divided by the quantity gives a **total** cost per unit to the date taken, which means nothing.

It is necessary to show the **actual** cost per unit as the job progresses, to be able to state whether it is comparing favorably with the cost of similar work and to change equipment and methods if the costs are too high. This is the thermometer used in taking the temperature of the job, and it is of direct benefit to the job analyzed if properly interpreted.

Work being done under Day Labor Work Order D-582 (road I-DN-1-C) is a typical job of grading and surfacing in heavy work. It is a prison camp project which has had a total allotment to date of $520,000, with a total expenditure to December 31, 1926, for construction of $502,000. The

expenditure per month has averaged from $15,000 to $20,000. The principal contract items are clearing, grading, surfacing and culverts. An account of cost is kept of each contract item, and the same system of arriving at the cost to date used.

Costs are divided as follows:

DISTRIBUTABLE COSTS.
INVENTORY.
GENERAL PERIOD COSTS.
DIRECT COSTS.

DISTRIBUTABLE COSTS—General costs incurred at the beginning and during a job which are properly a charge against all of the items of a contract.

When the job is started a camp must be built, grade trails constructed, construction bridges built; and these things also must be maintained. These are costs which should be borne by all of the contract items in the proportion of each contract item cost to the total cost of the job. The total cost to be borne by each contract item is divided by the quantity of this item and the result is a distributable cost per unit to be added to the direct cost of the item, when reported. The distributable cost is kept in an account by itself, the account being debited as contract items are finished and reported. It is necessary to revise prorations if the actual distributable costs vary greatly from the estimated costs. This proration was changed twice during the two years of work on the D-582 job, and is now $0.036 per cubic yard of excavation, $25.41 per acre of clearing, and so on for the other items.

A total of $32,650 has been spent on the job in distributable costs to date, and $24,000 of this amount has been distributed to contract items. The remaining $8,650, plus any additional amount spent in the interim, will be prorated against the contract items yet to be completed.

INVENTORY—That portion of the expense of a particular contract item resulting in partial completion of the item, as plant costs chargeable to but one item, material and supplies.

After the grade trails, camp and construction bridges and roads have been built, or rather after they have been started, the clearing gang and drilling and shooting gangs, are organized and follow in the order named. Clearing in heavy work is performed in from two to three operations, clearing underbrush and small timber, falling large timber, and dragging or cutting the logs clear of the roadbed. That portion of the expense resulting in partial completion of the item is carried in inventory, station by station, on the report, and added to the cost of the item as the item is completed.

The same applies to the drilling and shooting prior to the actual operation of grading. Plant set-ups for surfacing and aggregates, and materials received but not placed, also come under this head.

GENERAL PERIOD COSTS—These are general costs for any period which apply only to the contract items worked on during that period, as the time of the superintendent, timekeeper, blacksmith, etc. These costs are prorated out each period to the contract items, inventory and distributable costs in the proportion of the period expense of each item to the total period expense.

DIRECT COSTS—These are the direct costs of completing the contract item, as the time of the men and equipment necessary to excavate a certain number of cubic yards of grading. To this cost is added the distributable cost per unit, the inventory and the general period cost to arrive at the total actual cost, when the same is reported and carried as a completed contract item cost.

Field Accounting.

To complete the system it is necessary to inaugurate a system of field accounting which will insure that all of the costs of the job to date are in the total reported costs, in the proper contract item account and are segregated according to the requirements of the Accounting Department.

A chart of the total job costs and distribution of same is kept in the field as follows:

As each field requisition is made out it is entered with the field requisition number, the purpose of the requisition, and the estimated cost and date.

When the division requisition number is received it is entered on the same line in the next column with its date.

The purchase order is next entered with its date and amount.

The receiving record with its amount and date is next entered. When the receiving record is entered the job is charged with the amount shown thereon and the amount is distributed to the proper contract item column. There will be as many columns on any pob as there are contract items in the job and a column each for Inventory, Distributable Costs and Engineering.

The schedule is entered when received in the next adjacent column.

If the schedule amount differs from the receiving record amount, which has previously been posted, another entry is made showing schedule and purchase order number and the amount of the difference in green ink in the P. O. column. The difference is distributed to the proper contract item account in green ink and a circle placed around the original distribution made from the purchase order amount. This enables the distribution of the scheduled amount to be quickly located.

Distribution of Schedule.

When the schedule is in, the amount is distributed according to the analysis of cost required by the Accounting Department. These subdivisions are as follows:

A. Salaries and Wages.

B. Materials and Supplies—segregated into Construction, Small Tools and Supplies, and Commissary.

C. Service and Expense—segregated into Compensation Insurance, Transportation on Labor, on Equipment and on Material and Miscellaneous.

D. Equipment Rental—segregated into state and other under this head.

E. Administration.

F. Engineering.

A total is struck on the chart each month and the financial statement and monthly cost report made and checked against the chart totals. The monthly cost report contains tables showing Period Costs and the manner of arriving at the same; Distributed and Undistributed Costs, Inventory, Comparative Table of Cost to Date and Preliminary Estimate of Cost; Distribution of Free and Convict Labor by man days; Equipment on job and Equipment Rentals. The monthly report also contains a detailed progress estimate, station by station of each contract item furnished by the resident engineer.

The detail involved in making up the chart is difficult to explain in a brief article and from a casual reading may seem to be cumbersome and not in all particulars necessary. However, when it is considered that all of the information shown on the chart is necessary in making up the various reports required by central office or in keeping a proper record of transactions and costs on the job, the details become clearer. The objects are:

1—The listing of each item from original field requisition to final schedule makes an invaluable record which is constantly in use on the job. It also keeps track of material requisitioned and kept the field advised of when the material ordered may be expected on the job.

2—The distribution of each item of expense on the job into the various contract items is required by Federal Aid regulations, this being a Federal Aid project, and is also necessary in keeping the actual costs of each contract item.

3—The segregation into the objects with their subdivisions is required by the accounting department.

4—The monthly cost report with the tables noted therein are required by central office. It is through this monthly cost report that the cost of work is watched at the division office and suggestions made for a change in method when the costs exceed what seems reasonable for any item.

The detailed progress report made by the resident engineer tells exactly where the work has been opened up and where changes can be made without abandoning work completed.

On major jobs the preparation of the chart and monthly report takes most of the time of one man. At the end of the job, however, all of this work has been completed and has been done at the time that each transaction is still fresh in mind. The old system of digging through schedules and guessing at distributions is entirely eliminated. The system has been in operation in Division I long enough to demonstrate that it works satisfactorily.

(Continued on next page.)

SEVERE WINTER EMPHASIZES IMPORTANCE OF SNOW REMOVAL

THE present winter which is probably the most severe California has witnessed for a decade emphasizes the importance of the snow removal activities of the California Highway Commission. With the exception of some activity between Truckee and the Nevada line by Division III and occasional removal work at a few other locations, practically all of the snow removal on state highways is done by Division II and VIII.

Keeping the Pacific highway open is the most important task of Division II. Up to the middle of February snow had been removed on twelve separate occasions in the vicinity of Mount Shasta City, Siskiyou County, which is the headquarters for the crew operating the big rotary plow that clears a path for motorists after each storm. The ice layer which sometimes forms when snow is packed by traffic after the initial work by the plow, is removed by a push plow and scraper operated by a truck or tractor. After the ice is scraped off, the hazard of freezing moisture, which in places

Snow removal by push plow on rock-surfaced Fredonia summit between Westwood and Susanville, Lassen County.

causes a slippery condition, is overcome by scattering sand on the pavement.

Snow Removal on Laterals.

Snow removal work also has been done by the division fifteen or more times this winter on Route 28, between Redding and the Nevada border near Cedarville, Modoc County. The highway between Redding and Weaverville, Trinity County, also has been kept open in a similar manner.

On Route 29, snow removal work has been done over Fredonia Summit, between Westwood and Susanville, permitting all winter travel between these two busy Lassen County lumbering centers. The latter is a cooperative project. the county furnishing the tractor and the commission the plows and trucks. The commission also pays the cost of operation of the outfit.

None of the routes mentioned were open to all-year travel before the days of the state highway. This fact accentuates the importance of the snow removal program.

Maintenance Superintendent R. A. Tremper is in general charge of snow removal work on the Pacific highway. The foreman in charge of the plow at Mount Shasta City is E. M. Shelton. Maintenance Superintendent J. W. Clarke of Canby supervises the work in Modoc County, which is done by E. B. Johnson, foreman of the crew operating over Cedarville Mountain.

Cost Accounting

(Continued from page 4.)

C. E. Malm, Board of Control Accountant, designated the segregations required by the accounting department, and printed forms have been prepared with these cost analysis headings, leaving the columns for contract item blank, so that they may be used for all types of jobs. It is proposed that the forms be printed on both sides, so that when the binder is laid open the double page will cover most of the distribution columns required on any contract. As many fly sheets as are necessary will complete any number of columns required.

The carrying of the inventory and distributable cost as suspense accounts until the contract item is reported was the idea of Division Engineer T. A. Bedford. The details were worked out by members of the field and office staff of Division I engaged in making and checking the cost reports.

FEBRUARY STORM DAMAGE

AS THIS issue of the Bulletin goes to press reports are reaching headquarters of severe storm damage in Divisions I, II, VII, and VIII, due to the heavy and continuous rains which were general over the state.

Numerous heavy slides occurred on the Redwood highway blocking traffic for several days. The Pacific highway also was closed by a slide in the vicinity of Castella, Shasta County.

Sections of pavement and several bridges were washed out in Division VII, both north and south of Los Angeles. The Los Angeles-San Diego highway was closed to traffic by a washout in San Diego County. A preliminary estimate of the cost of restoring highways in the division was placed at $270,000 by Division Engineer S. V. Cortelyou.

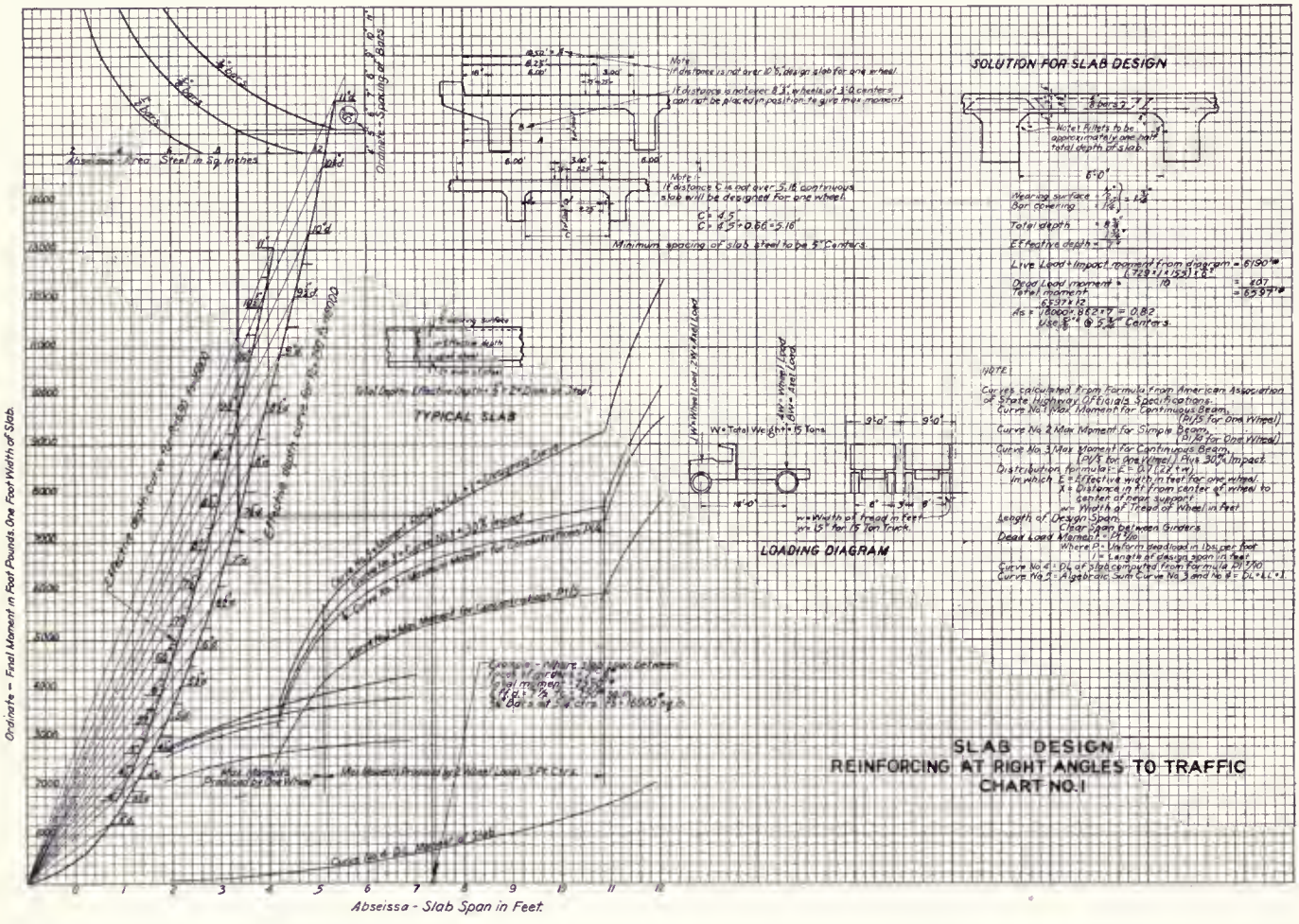
California, during the calendar year of 1926, registered a total of 1,600,475 motor vehicles. This does **NOT** include trailers or motorcycles. The total number of trucks registered was 216,323.

Follow-up crew; maintenance outfit scraping ice from pavement, Pacific highway, after removal of lighter snow by plows. Slippery places are sanded to safeguard traffic.

Graphic Charts and Their Use in Bridge Designing

By Harvey D. Stover, Office Engineer, Bridge Department.

IN THE design and preparation of plans for bridges where speed and accuracy are required, graphical representation of a series of calculations very often proves of great value. Particularly so, in a case where practically the same problem occurs many times with the fundamental condition of the problem changed but slightly. Also, where use is made of a series of empirical formula, a graph will plainly show any erroneous assumptions or prevent errors which may occur in independent calculations. It is necessary to note, however, that, due to changes in specifications for unit stresses and live loads used in design, it is necessary to occasionally revise any chart or graph to keep it up to date.


SOLUTION FOR SLAB DESIGN
TYPICAL SLAB
LOADING DIAGRAM
SLAB DESIGN
REINFORCING AT RIGHT ANGLES TO TRAFFIC
CHART NO. 1
Ordinate = Final Moment in Foot Pounds. One Foot Width of Slab.
Abscissa = Slab Span in Feet.

The accompanying chart No. 1 has been prepared for reinforced concrete slab design with reinforcing at right angles to the direction of traffic, and chart No. 2 has been prepared for reinforced concrete slab design with reinforcing parallel to the direction of traffic.

As a starting point in making clear the use and meaning of the charts, let us first consider chart No. 1. Take for instance, any distribution formula for a concentrated load as applied to slab design; by solving this formula for any given concentration, the distribution width in feet for various slab spans can be obtained. To consider, then, that part of the load to be carried on 1-foot width of slab, it is but another step to obtain the maximum moment that this load would produce for various spans. By plotting the span length in feet on the abscissa and the moments in foot-pounds on the ordinate, a resulting graph can be made (curve No. 1) which will give the maximum moment on a section of slab 1 foot wide for the various spans under consideration. The impact due to the concentrated or live load will be the required percentage of the live load, and by adding this percentage to curve No. 1, we get a curve representing live load and impact, which is noted on the chart as curve No. 3. Curve No. 2 is used only for simple spans and, therefore, is not often used in slab design. From the calculated weights of slabs that have been designed for various spans, the corresponding dead load moment is shown on curve No. 4. The addition of the ordinate of curve No. 4 to those of curve No. 3 gives the resulting curve No. 5, for use in design.

Since, for any given moment, a slab of 1-foot width would have but one economic depth for a given fiber stress of concrete, by plotting as ordinates the effective required depth of slab in inches and establishing a new abscissa showing area of steel in square inches, another curve can be obtained showing effective depth of slabs for foot of width with concrete fiber stress of 650 or 750 pounds per square inch as required.

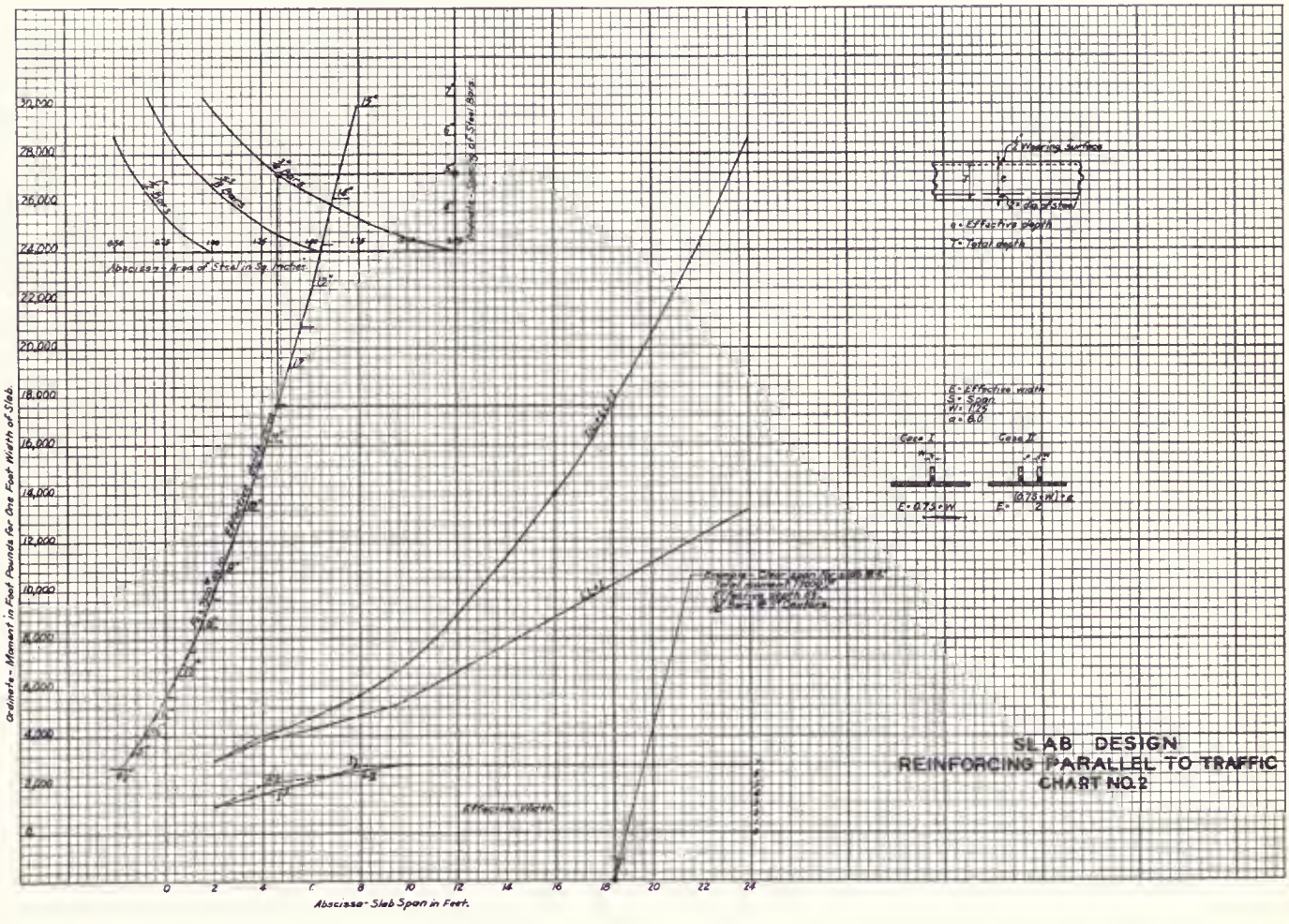
Typical Example of Chart's Use.

By laying off a known ordinate (steel ordinate) showing spacing of steel bars, a curve can be drawn for the various sizes of steel bars that are used in common practice. To

make certain that the method of using the chart is clear, let us consider, for example, having already found by preliminary studies that the most desirable structure to provide a 30-foot roadway for a given location would be a 3-girder concrete bridge and that the clear span between girders (slab span) is 7' 4", the necessary steps in designing the slab would be to locate 7' 4" on the span abscissa. The moment shown on the design curve (No. 5) is approximately 7500 foot-pounds. By following this on a horizontal line to the effective depth curve, the required effective depth is found to be 7½"; from this point going vertically to the steel curve, we would have half-inch bars at 3½" centers which would be too close a spacing for practical use. Therefore, we would use ⅝" bars at a spacing of 5½" centers.

Chart No. 2 for the design of slabs where the steel is placed parallel to the direction of traffic is similar to chart No. 1 and its use will be self-explanatory.

These charts have proved of great value in checking plans as well as in the preparation of new plans. Similar charts also have been provided for use in designing simple girders and T-girders as used in reinforced concrete bridge design. They save time and make for greater accuracy in the work of the Bridge Department.


Ordinate - Moment in Foot Pounds for One Foot Width of Slab.
Abscissa - Slab Span in Feet.
Abscissa - Area of Steel in Sq. Inches.
SLAB DESIGN
REINFORCING PARALLEL TO TRAFFIC
CHART NO. 2

TRUCK DRIVER IS FINED FOR RUNNING DOWN MAINTENANCE MAN

DIVISION VI has followed the example of Division Engineer S. V. Cortelyou of Los Angeles in insisting that users of the highways show due regard for the safety of employees of the commission engaged in maintenance work. While at work on the highway in Tulare County recently, an employee of Division VI was struck down by a truck, the driver of which did not stop but endeavored to get away. The number of the vehicle was secured by another member of the crew after a long chase.

The truck driver was arrested on a felony warrant charging him with failure to stop and render assistance to the injured man. During the hearing before Justice of the Peace J. L. Swanson, of Pixley, the charge, with the consent of the injured employee, was reduced to one of reckless driving. The truck driver then paid a fine of $50 and promised to exercise extreme care in the future while passing men at work.

Maintenance employees endeavor at all times to serve the convenience of the public, but they are necessarily required to place themselves in places of danger, and drivers owe them the legal and moral duty of exercising care when passing points where work is under way, it is pointed out by Acting Division Engineer E. E. Wallace.

The division announces its determination to follow up all similar cases of injury to maintenance employees. It will insist that all offenders be brought before the courts without delay.

San Bernardino Division Headquarters Credit to State

BEAUTY AND UTILITY—Views of the new division office building of the California Highway Commission at San Bernardino.

LOCATED near the business district and near the very spot on which the original settlement was made, the new division buildings of the California Highway Commission in San Bernardino have been completed and are now occupied by the staffs of Division VIII and the Equipment Department. The architecture of the office building is Spanish with an adobe effect, in keeping with the historic traditions of the site which adjoins that of the old fort and stage station of early days. It is of concrete and tile construction. The shop and maintenance buildings are of standard construction of concrete, timber, and galvanized iron.

The office building has floor space 80 by 85 feet with ample basement room for storage of supplies. A large fireproof vault also is located in the basement for the safe keeping of division records. The building was planned by Howard E. Jones, San Bernardino architect, and was erected by George Herz and Company of San Bernardino, contractors, at a cost of approximately $30,000. Spanish atmosphere is a special feature of the building which is colored in soft tints, while the roof is of varied shades of red tile.

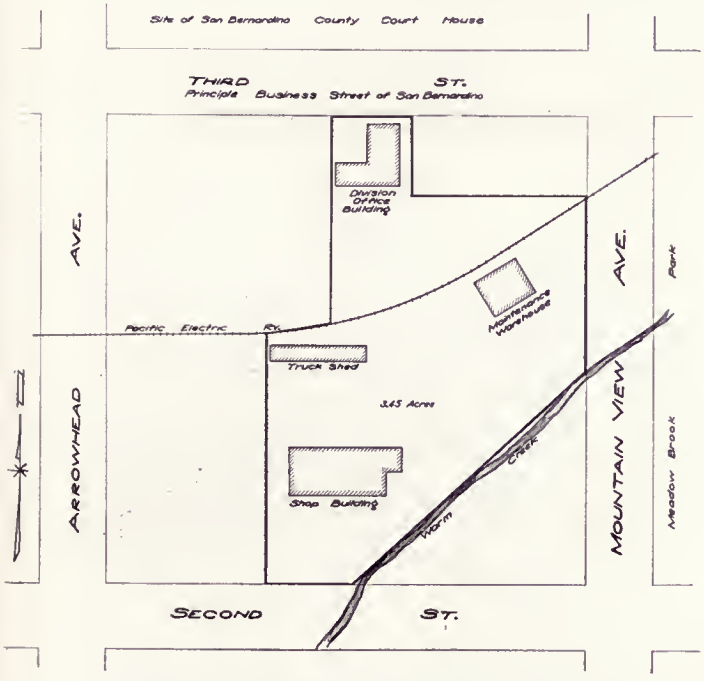
The shop building is 60 by 140 feet and the truck shed is 26 by 126 feet. Both buildings were erected by Houghton and Anderson, contractors of Los Angeles, at a cost of approximately $25,000. They are served by a spur track of the Pacific Electric Company.

The buildings have been erected on a state-owned site of nearly three and a half acres. The division office building faces on Third street and is opposite the site of the new San Bernardino County court house, which is now under construction and nearing completion.

The site was purchased by the commission, with the approval of the Board of Control, in 1924, for $10,000. The

growth of the district has so increased values that the property, exclusive of the improvements, is now appraised at several times the price paid three years ago. Besides ample space for parking and for the enlargement of present shop and office facilities, there is room for the establishment of a nursery, where it is proposed to propagate shade trees and ornamental shrubs for planting around maintenance stations and along the highways of Southern California. A flowing well of excellent water is located on the property and a running stream borders the tract on the east, while just across this stream is Meadow Brook park.

Division VIII was created in 1923, taking over from Division VII the management of highway construction and maintenance



in San Bernardino, Riverside, and Imperial counties. Prior to the erection of the division office, the staff of Division Engineer E. Q. Sullivan was temporarily housed in the San Bernardino City Hall through the courtesy of the city government. This space, however, was needed by the municipality, which moved the commission to acquire its own permanent headquarters for the division.

Our automobile figures run into millions, and so, apparently, do our automobiles.

—American Lumberman.

SETTING THE EXAMPLE—AN EDITORIAL ON FIRE PREVENTION

(From the Napa Journal.)

DESPITE the fact that there is now in force a state law making it a misdemeanor to throw lighted matches, cigarettes or cigars from moving vehicles onto the highway, it has been found necessary to spend still more state money in the direction of fireproofing both sides of state roads. This work, which involves the removal of all forms of debris from the roadsides in Tuolumne, El Dorado and Mendocino counties, is being done by forest rangers under the direction of the State Board of Forestry and the *State Highway Commission*.

It is difficult enough to apprehend perpetrators of deliberate arson; there are very few convictions on record for this crime. The motorist who throws lighted smokes from the window of his car is a form of firebug even more difficult to detect and arrest. Even motorists who see the act committed by another are apt to hesitate about testifying against him. The habit is just a habit, and it is a bad one that should be corrected.

The owners of cars not now equipped with a metal ash receiver should see that one is provided. They cost but a few cents and are easily attached to the indicator board. The trouble is that one sees another flick a cigarette and then follows suit unconsciously. Conscientious motorists, by breaking themselves of the habit, will set a good example that the careless driver may be in time inclined to follow.

SAFE AND SOUND.

Stop and let the train go by,
It hardly takes a minute;
Your car starts off again intact,
And better still—You're in it.

—Boston Transcript.

MAINTENANCE MAN MEETS DEATH.

While driving to the point where he was to take up a count of traffic early on the morning of January 16th, Carl Richardson, maintenance employee of Division I, was killed, when his automobile left the road and was wrecked. His twelve-year-old son, who was with him, also met death in the accident. It was dark and raining hard when Richardson set out for his post of duty. The accident occurred in the vicinity of Bartlett Mountain in Lake County.

The dead employee is survived by a widow and a large family of children.

INSURANCE FOR ENGINEERS.

The American Association of Engineers has perfected plans for "Unemployment Insurance" for professional engineers. The American Association of Engineers will presently arrange to cause this insurance to be written, all of which will be another step forward towards the welfare of the engineer.

SAN BERNARDINO SHOPS—New shop and warehouse buildings of the California Highway Commission at San Bernardino, headquarters for San Bernardino, Riverside, and Imperial counties. (Photo by Division VIII.)

UNIQUE EARTH MOVER IN USE ON PENINSULA HIGHWAY

A NEW and unique piece of road building equipment which may prove of great value in highway construction is now being demonstrated on the Peninsula highway, in San Mateo County, by the Kaiser Paving Company of Oakland, contractors for grade widening operations in the vicinity of Cypress Lawn cemetery. The machine is a telescoping earth mover which is capable of excavating, moving, and depositing, in one continuous operation, as much as 15 cubic yards of material. It is designed for operation as a one-man unit by R. E. Le Tourneau of Stockton, the inventor.

The machine already has been used by the Kaiser Company with considerable success in the building of an earth-fill dam. Where soil conditions permit, its use on roadway excavation and embankment may be an interesting development of highway construction. On the Peninsula contract the sandy nature of the soil had made for its maximum efficiency in operation.

Engineer Describes Operation.

The following description of the operation of the Le Tourneau invention has been prepared by Resident Engineer H. S. Payson, of Division IV, for the benefit of the engineering staff of the commission:

The Le Tourneau machine consists of five telescoping compartment without backs, each 7 x 3 x 3 feet in size; the first is fastened rigidly to the frame and has attached to it the cutting edge of the apparatus. The frame is mounted on caterpillar tracks by being pivoted on a central axle. The vertical movement of the cutting edge is operated by an electric motor through a rack and pinion. The horizontal movement of the compartments is operated by another electric motor mounted on the tail gate, also through a rack and pinion. Electricity for the motors is produced by a generator mounted on the 60-H.P. caterpillar tractor to which the machine is attached. The generator is driven by a belt from the fly-wheel of the tractor. Switches are conveniently located for the tractor operator, one being at his foot and the other at the side of the seat for operation by hand.

As previously explained, the number one compartment is fastened rigidly to the frame, or chassis, and into it are nested the other four compartments. In loading, the frame is depressed so that the cutting edge is excavating all the cut that the two tracors can make without slipping their tracks.

Compartment number five is loaded first and is pulled back by the tail gate, exposing compartment number four which receives its load as number five is receding. Number five recedes until its front end rests on the back end of number four; it then picks up number four and takes it along with it. Compartments five and four continue in backward motion exposing number three, which begins to receive its load, and so on, until the front end of compartment number two rests on the back end of the fixed compartment number one. When fully loaded, the machine appears to have but one compartment, fifteen feet long, instead of one three feet in length, as at the beginning.

To unload, the action is simply reversed. Compartment number two slides into number one, pushing the material out of number one, while the cutting edge is lowered to the desired spreading elevation. Then compartment number three slides into number two, and so on. When compartment number five reaches its forward position inside the others, the tail gate slides through emptying the entire load except the small amount of material on the cutting edge.

Action is Continuous.

The loading and unloading action is steady and continuous and is controlled by the electric motor on the tail gate, which in turn is operated by the switch at the driver's seat.

There is no operator on the machine, other than the driver of the tractor, as the two reversing switches control all the movements of the compartments.

When loaded by one 60-H.P. tractor, a load of 8 to 10 cubic yards is handled, but when assisted by a snap tractor a load of 14 to 15 cubic yards may be moved at one time. A snap tractor will take care of three or four machines, according to the length of haul.

When the machine arrives at the loading point, a short stop is necessary to hitch on the snap tractor. After the cutting edge has been lowered to make a 3- or 4-inch cut, both tractors start in low gear and the tail gate is run back just fast enough to allow the sections to become loaded. An efficient operator is not satisfied unless the material is well heaped up and falling off the sides.

When the machine is fully loaded another short stop is necessary to detach the snap tractor; the front end is elevated and the load transported on the caterpillar truck in high gear (5 to 6 miles per hour) to the embankment. To deposit the excavated material the front end is lowered so that the cutting edge clears the ground from one to six inches, depending on the spread required. Spreading is usually done in low gear in order to supply sufficient electricity for satisfactory operation of the electric motors. It is difficult, it would seem, to deposit material in lifts greater than 8 to 10 inches, and for this reason the machine does not lend itself readily to filling small areas, as around buildings, but works best on long cuts and fills. Eight to ten minutes are required to make a complete round trip on a 1200-foot haul. A maximum loading is possible on minus grades.

SUPER EARTH MOVER—Views of a Le Tourneau earth mover in use by contractor on Peninsula highway widening project, San Mateo County. *Above*, caterpillar tractor with snatch; *below*, mover lifting full load of approximately 15 cubic yards of material.

The Le Tourneau machine is electrically welded throughout and is without bolts or rivets except those used for making electrical contacts. No accurate cost data are available as yet, but on the basis of a rental of $100 per day a movement of 400 to 500 yards would make the cost approximately $0.25 a cubic yard.

For the most satisfactory results in excavation, cuts should be 200 feet or more in length and the material to be excavated should be of such a nature that its movement may be really accomplished by plowing or by use of scarifiers and Fresno scrapers. It is hardly probable that these machines will prove successful in rocky formations, requiring heavy blasting, or in comparatively narrow cuts. The track requires a width of eleven feet for ease of operation and clearance.

Compacting of fill material moved by the machines on the Peninsula highway, however, has been very satisfactory. It was

(Continued on next page.)

Decision Gives Prison Road Workers Accident Compensation

PRISONERS from the state penitentiaries employed in the construction of highways come within the provisions of the California Workmen's Compensation Act and in case of injury are entitled to compensation. This decision of the State Supreme Court, in the case of the California Highway Commission vs. the Industrial Accident Commission and Robert Smith (72 Cal. Dec. page 582), is of considerable importance and has attracted much interest among those interested in development of the prison road camps.

The decision was rendered in the case of Robert Smith, a negro, who became blind as the result of an injury received in a premature blast on the Yosemite all-year highway. His case was fought through the commission and the courts to success by Milton J. Schmitt, an attorney of San Francisco, himself blind.

An effort is now being made by the highway commission and the management of the State Compensation Insurance Fund to determine the best method of providing the additional insurance for the men in the camps which the decision has made necessary. The amount of additional premiums which will be charged, the commission has not yet been determined.

The Court's Opinion.

The opinion of the court is, in part, as follows:

Certiorari to review an award of the Industrial Accident Commission. * * * Robert Smith, * * * on March 10, 1922, was sentenced to state prison for a term of from one to fifteen years. After serving the minimum sentence of one year the board of prison directors fixed his full sentence at five years. Shortly thereafter Smith made application and was granted permission to perform work on the public highways of the state under the direction of the State Highway Commission, he being eligible for this privilege. One of the benefits enjoyed by prisoners assigned to this character of work is a credit on the sentence to be served of two days for every one day of service at highway work. Shortly after his assignment to a prison camp, chapter 316 of the laws of 1923 became effective. This act provides, among other things, for the payment of compensation to a convict for work so performed by him, and Smith received the benefits conferred by the act.

On March 17, 1924, while performing his duties as a road laborer he was struck by flying fragments from an accidental explosion of a blast, causing him various and serious bodily injuries, including injuries to both of his eyes. Smith was thereupon returned to the hospital at San Quentin for treatment. Upon his discharge from the hospital he remained within the prison until he was finally paroled on account of the severe injuries he had received. His credits materially reduced the term of his sentence which was completed on June 25, 1925, at which time he was finally discharged from custody.

On August 25th, following, he filed an application with the Industrial Accident Commission for disability benefits by reason of his injuries. The state insurance fund was the insurance carrier and it was joined as a defendant in the proceeding. The commission made an award in favor of Smith. It provided for the payment to him forthwith of the sum of $791.52 as compensation for permanent disability and beginning with March 10, 1926, the further weekly sum of $7.76 for a period of 138 weeks, and after the expiration of that time, the weekly sum of $4.79 for the remainder of his life. The award was made upon the theory that the relation of master and servant existed between California Highway Commission and the applicant by reason of the provisions of the act of 1923, providing for the payment by the commission to convicts for services performed by them on the state highways.

The sole question, therefore, that is here presented is whether or not a convict engaged in the performance of labor on a state highway under the provisions of chapter 316 of the laws of 1923 is an employee within the meaning of the Constitution and Workmen's Compensation Act.

There is no provision either in the organic law or the statutes which directly includes or excludes them as such. The question, therefore, concerning what relationship exists between the state and an incarcerated convict so employed on the highways involves the proper construction to be given to the various laws relating to the subject. * * *

In the year 1923, the legislature enacted what is generally known as the Convicts Road Camp Bill (Stats. 1923, chap. 316, p. 667). This act, among other things, provides that the State Highway Commission may employ or cause to be employed on the highways of the state certain convicts confined in the state prisons, and that when so employed such convicts shall receive a specified compensation not exceeding seventy-five cents net per day for their labor.

Provision is also made for authority of the prison directory to send the number of convicts to a prison camp as may be requisitioned by the commission. Under these conditions it is respondents' claim in the support of the award that this act entirely changes the status of convicts who may be assigned to work on the highways, and creates a **new class** of paroled prisoners between whom and the state a relationship is created, one of the incidents of which is a liability under the Workmen's Compensation Act for injuries.

Respondents seem to concede that while engaged in work within the prison walls, this claimed relationship does not and can not arise, but they insist that there is logically and necessarily a real, definite and distinct difference between the status of a convict **within** and one **without** the prison walls performing work upon the highways under the provisions of the act in question that as to the latter it was the intention of the legislature as evidenced by the use in the act of the words **"employ"** and **"employment"** to authorize the State Highway Commission to enter into a contract of employment with convicts released for such work. **We are of a like opinion.** It may be conceded that one serving a sentence of imprisonment in a state prison is, in contemplation of law, a prisoner therein, as well when at work outside, under surveillance of the prison guards, as when confined within its walls (Bradford vs. Glenn, 188 Cal. 350).

The power, however, to deprive a prisoner of his civil rights is one that resides in the legislature. The power to thus deprive a prisoner of such rights must include the corresponding power to restore them. This we think was the manifest intention and purpose of the Convicts Road Camp Bill. The legislature is in keeping with the modern idea that it is for the benefit of society to rehabilitate those possessing criminal instincts and one of the means employed is to partially restore to them their civil rights to contract for their labor as an encouragement to that end. The act so expressly indicates, for it provides by the very first section thereof that the **"State Highway Commission may employ or cause to be employed, convicts confined in the state prisons, etc."**

In the same section it is provided that all convicts so employed shall receive the compensation provided for, and

(Continued on next page.)

EARTH MOVER IN USE ON PENINSULA HIGHWAY

(Continued from page 10.)

found impossible to make an impression on completed fills with sheep-feet tamping tractors (Fordson).

The cost of operation should be less than for shovel and trucks of equal capacity because of the lesser number of men required as well as a reduced consumption of gasoline and oil. The machines undoubtedly merit close observation by highway builders.

A tourist driving over a reconstruction job near Merced, just after the concrete shoulders had been completed, stopped and remonstrated with the long suffering resident engineer.

"I think," said he, "the highway commission is making a serious mistake in building the sidewalks so high and so close to the pavement."

The dentist had been trying to collect a bill for a set of false teeth.

"Did he pay you?" asked his wife.

"Pay me! Not only did he refuse to pay me, but he actually had the effrontery to gnash at me—with *my* teeth!"—*Good Hardware.*

BOARD OF CONTROL EXPERT TO HEAD ACCOUNTING DEPARTMENT

THE appointment of William Schleip, formerly of the staff of the State Board of Control, to the position of Principal Accountant for the California Highway Commission has been announced by the State Highway Engineer, effective as of February 1st. Mr. H. B. Weaver remains in charge of the Headquarters accounting office.

Mr. Schleip has had many years of experience in connection with the financial affairs of the state as superintendent of accounts for the Board of Control and is well qualified to assume his new position. In announcing the appointment, Mr. Morton said:

> Now that our revised accounting systems are in use, it is desirable that the accounting become a well defined department of the highway organization. As Principal Accountant, Mr. Schleip will have supervision over the personnel in the various accounting offices and responsibility for results. His supervision will also extend to modifications of the systems, preparation of accounting data, and financial control reports.

CUBA AWARDS RECORD CONTRACT.

A special Board of Award has recommended to the President of Cuba the award of the largest highway building contract on record. It proposes an expenditure in a single contract of nearly $76,000,000 for the grading and paving of a central highway for the entire length of the Island from Guane, Province of Pinar del Rio, to Santiago de Cuba, 750 miles. The paving of the highway is declared an economic necessity for the development of the social and business life of Cuba and for the greater attraction of tourists.

The proposed expenditure is at the rate of over $100,000 per mile. It will be paid for by the collection of special gasoline and other taxes.

COMPENSATION DECISION

(Continued from page 11.)

such compensation is referred to as earnings. The word **"employ"** has a definite legal meaning and legal terms when used in a statute are to be construed according to the context and the approved usage of language unless a different sense is obviously intended. (Civ. Code, sec. 13; Fidelity and Casualty Co. vs. Ind. Acc. Comm., 191 Cal. 404.) There is nothing contained in the statute which indicates that a different meaning was intended. On the contrary, its manifest object was to authorize those who were afforded the privilege to enter into a contract of employment with the State Highway Commission to have restored to them the limited civil right which the reformative measure provides for. The statute as a whole should be liberally construed to carry out its beneficent purposes. (Western Ind. Co. vs. Pillsbury, 172 Cal. 807.)

It was in evidence and it is not disputed that it was optional with prisoners as to whether they would accept this labor or not. They were at liberty to refuse it and in some instances it had been refused. Having accepted it, however, the applicant was entitled to all the rights under the act, one of which must be held to be the benefits enjoyed by employees under the Workmen's Compensation Act. The legislature having the power to restore the suspended civil rights of a convict and having the further power to compensate them for the character of the work in question, it follows that the sum provided for does not constitute a gift under section 34 of article IV of the constitution, as suggested by petitioners.

We conclude, therefore, that under the terms of the Convicts Road Camp Bill the legislature intended to restore to a convict assigned to work upon the public highways such limited civil rights as are necessary to create the relation of master and servant between him and the State Highway Commission, and this being so, he must be held to be an employee within the meaning of the Workmen's Compensation Act. It follows that the applicant is entitled to all the benefits of this act and the Industrial Accident Commission was correct in so concluding.

For the reasons given the award is affirmed.

BRANAGAN SUBWAY—Before and after views of a recently completed improvement on the south coast highway near Newport Beach, Orange County.

BRANAGAN UNDERCROSSING

Completion of the under crossing separating the highway and the Southern Pacific Railroad at Branagan, Orange County (VII-Ora-60-A) is announced by the Bridge Department. This structure is located on the Newport-Serra section of the new south coast highway. It was built at a cost of approximately $25,000.

The plans provided for two concrete abutments with wing walls, and the grading and paving of the roadway and sidewalk. Steel girders supporting the railroad track were placed by the railroad company.

W. M. Ledbetter and Company, of Los Angeles, was the contractor. A. L. Richardson was resident engineer for the commission.

SOLANO PROFITS BY BOND PURCHASE.

THE sale recently by Solano County of $200,000 worth of State Highway Bonds to a San Francisco bond house is reported by the Vallejo *Times-Herald*, and brings to notice benefits which have accrued to the county by reason of the original purchase.

The bonds were acquired twelve years ago with surplus county funds. During the period the county has held the bonds, it has received $96,000 in interest. The funds received by the state, when the bonds were purchased, helped to complete state highways which have been in use by motorists for a considerable period.

It would be interesting to know, if the facts were determinable, the amount of dividends received by motorists in decreased operating costs because of the expenditure in Solano County of the original $200,000. And the county still has its $200,000 in cash.

INVERTED PAVEMENT SECTION PREVENTS EROSION OF FILL

AN INVERTED section to prevent erosion by drainage of the high sand fill at the approach to the M street bridge, West Sacramento, was an outstanding innovation of a paving project recently completed under the direction of Division X. The contract is a part of the commission's program of improvement of the entrances to the state capital. By building the new M street approach, both the M street and Southern Pacific bridges across the Sacramento River have been made available to traffic entering or leaving Sacramento from the west.

It was thought it would be necessary, when the project was first considered, to include curbs and gutters in the pavement design to prevent erosion of the fill by such drainage as would result from the usual crown section. To overcome this, it was decided to depress the pavement and carry the drainage down the center. This was accomplished by dropping the inside edges of the outside 10-foot sections (30-foot pavement placed in three strips), 1½" and an inch more to the center of the middle section. This made a total depression from the outside edge of 2½ inches.

Two concrete catch basins were placed beneath the center of the pavement, one-half way down the steepest grade and the other at the foot of the grade where the transition was made to the standard crown section. Water is drained from these catch basins by metal pipes and the basins are covered flush with the pavement by cast-iron gratings.

There has been considerable heavy rainfall since the job was completed, but the division reports results have been satisfactory.

H. Brown of Sacramento was the contractor for the building of the pavement. This was placed in three 10-foot strips, each 7" thick in the center, increasing to 9" in the outer two feet. Transverse bituminous expansion joints ½" wide were placed at intervals of 50 feet. Each joint in each strip is supported by five ¾" by 24" dowels, with one end fixed and the other free in a slip joint. No longitudinal expansion material was used as the two outer strips were placed first, which left a cold joint when the center strip was poured several weeks later.

Ford dump trucks were used for hauling aggregates to the mixer. Aggregates were measured in three measuring hoppers suspended under bunkers. C. A. Potter was resident engineer on the project, having as assistants at various times L. E. Ford and G. C. Harden.

The new section of pavement at West Sacramento is .55 of a mile in length. The westerly end passes through the new subway under the tracks of the Sacramento Northern Railway, the building of which was discussed in the May, 1926 issue of the Bulletin, page 11. The easterly end leads up on an easy grade to the M street bridge. It was built on a fill made by sluicing sand into place after it had been obtained from the bed of the Sacramento River by means of a clam shell dredge. This sluicing process was described in the April, 1926, issue of the Bulletin, pages 3 and 13. A blanket of clay soil over the sides of the fill protect it from erosion by wind action.

AT WEST SACRAMENTO—*Above,* new 30-foot pavement at approach to M street bridge; note center drain in pavement; *center,* method of holding transverse joints and dowels in place; *below,* new subway on improved alignment with safety walk for pedestrians.

Not the least of the difficulties in connection with the building of the M street approach was the securing of right of way. It was necessary to go to trial in eminent domain proceedings in the Yolo County Superior Court to secure an easement over 3.03 acres of the O'Connor and Harbinson property, immediately west of Second street, in Broderick. The owners asked $91,700 for value of right of way and damages. The jury after hearing the evidence of the defendants and the state, made an award of $5,030. A. M. Nash, right of way agent for Division X, assisted in gathering the evidence for presentation in court.

WHAT THE DIVISIONS ARE DOING

DIVISION III.

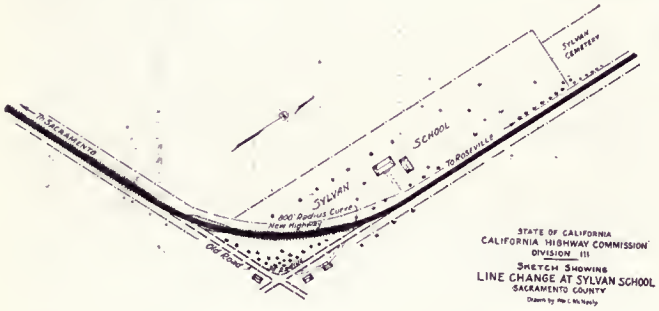
HEADQUARTERS, SACRAMENTO.

F. W. HASELWOOD, DIVISION ENGINEER.

Counties of Butte, Colusa, El Dorado, Glenn, Nevada, Placer, southern Plumas, Sierra, Sutter, Yuba, and northern Sacramento and Yolo.

THE line change at the Sylvan school corner on the Sacramento-Roseville highway (road III Sac-3-B) is being graded by C. R. Merrill, contractor, and by the time this is in print it is probable traffic will be using the improved line. It consists of an 800-foot radius curve which replaces a sharp turn with a 30-foot radius. What was formerly a very dangerous intersection is now a long, sweeping curve on pleasing alignment.

The board of trustees of the Sylvan School District is to be commended for its splendid cooperation. The district



transferred to the state that part of the school ground necessary to make the change possible. The state also acquired title to a clump of oak trees on the outside of the curve and between the new right of way and the old road. This will preserve the beauty of the roadside by preventing its use for commercial purpose.

Division III is now acquiring rights of way preliminary to the widening and thickening work planned between the Sylvan School and Roseville.

Division III is also engaged at this time in revising the standard of alignment of several grade separations on the Auburn route between Sacramento and Lake Tahoe.

DIVISION VI.

HEADQUARTERS, FRESNO.

E. E. WALLACE, ACTING DIVISION ENGINEER.

Counties of Fresno, Madera, Merced, Mariposa, Kings, Tulare, and Kern, north of the Tehachapi.

MAINTENANCE crews recently completed the oiling of several miles of shoulders along Route 4 in Tulare County with satisfactory results. The oil has bound the sandy soil and sealed up the clay. Shoulders are now held more firmly to pavement edge, preventing surface water from penetrating the subgrade. The oiling also has proved of much benefit in keeping the pavement clean and free from mud which formerly was carried onto it from the dirt shoulders.

An unusual feature of the work is the fact that much of the oil used was salvaged from pipe line leaks along the roadway.

Improvements Made on Lateral.

Considerable improvement work has been done on the Sierra-to-the-Sea lateral in western Fresno County by the maintenance crew of Foreman O. D. Gaston. The old county road, in one place, followed a creek bed for half a mile and in others unnecessarily crossed the stream. By making three channel changes and by building about 1000 feet of new grade, the road has been removed from the bed of the stream and considerably shortened. Residents of the district have complimented Foreman Gaston on the fact that the road throughout is safer and in much better condition than ever before.

Satisfactory progress is being made on the improvement of the Yosemite highway from Merced to El Portal. Four rock crushing plants are now in operation, two by convict

Line change to eliminate stream crossings on Coalinga lateral, western Fresno County, Division VI .

labor, one by contract, and one by maintenance forces. New bridges are now complete and narrow sections are being widened and surfaced.

An additional allotment of approximately $20,000 has been authorized by the Commission and surfacing work between Mariposa and Briceburg will be continued.

DIVISION VII.

HEADQUARTERS, LOS ANGELES.

S. V. CORTELYOU, DIVISION ENGINEER.

Counties of Los Angeles, Ventura, Orange, San Diego, and eastern Kern, south of Mojave.

ALL cement concrete pavement is now in place on the Oxnard-Hueneme cutoff on the Coast highway in Ventura County, and construction of rock shoulders is in progress. The test sections placed on this unit are attracting much attention among engineers and the public generally.

Damage to the subgrade done by recent earthquakes and storms having been repaired, placing of cement concrete pavement is now in progress on the Mountain Springs grade in San Diego and Imperial counties. Jahn and Bressi are the contractors.

A strip of concrete pavement 10 feet in width has been laid the full length, 3.2 miles, on the contract for reconstructing Whittier boulevard, Los Angeles County, between Michigan avenue, Whittier, and the Orange County line. Placing of concrete on the other two 10-foot strips, to complete a 30-foot pavement, is now in progress.

Construction of the new state highway through Laguna Beach, Orange County, 1.54 miles, has been started by the contractors, the United Concrete Pipe and Construction Company of Los Angeles.

DIVISION X.

HEADQUARTERS, SACRAMENTO.

R. E. PIERCE, ACTING DIVISION ENGINEER.

Counties of Amador, Calaveras, Alpine, Tuolumne, Stanislaus, San Joaquin, Solano, and southern Sacramento and Yolo counties.

MAINTENANCE crews of Division X are engaged in placing gravel shoulders on the Sacramento-Davis highway between the Yolo causeway and Davis. This stretch of highway is heavily traveled. It is expected that the increased width made available by the gravel shoulders will be an aid to traffic until such time as funds are available for pavement widening.

(Continued on next page.)

HIGHWAY NEWS NOTES

THE Kiwanis Club of Eureka entertained recently at a dinner dance at the Eureka Inn in honor of the appointment of Mr. Ralph W. Bull, a member of the club, to the chairmanship of the California Highway Commission.

In Santa Ana, the appointment of Mr. J. P. Baumgartner, as a member of the commission, was celebrated by the holding of one of the famous Orange County "rump" conventions, in which leaders of all parties participated.

Engineers and employees of Division VII presented Nelson T. Edwards, the retiring commissioner, with a beautiful desk set as a token of appreciation of his interest in their welfare during his term of office.

J. M. O'Malley has been transferred from Shop 6, at Fresno, to Redding, where he will be in charge of Shop 2 as superintendent. He takes the place of R. A. Allen who is no longer with the department.

R. J. Carlisle of Fresno has been appointed superintendent of Shop 6, it is announced by R. H. Stalnaker, Equipment Engineer.

R. P. Green, formerly of Division I and later with headquarters, is now chief draftsman for Division III.

Thornton May of the Bridge Department and J. E. Stewart of Division X, both draftsmen, have been loaned to the Montana State Highway Department and have left for Helena, which will be their headquarters for the next three months.

Division VII News.

C. V. Kiefer, Assistant Engineer, was recently married to Clara M. Jarde, of San Pedro.

R. D. Kinsey, Assistant Resident Engineer, has married Dorothy Norton, of Escondido.

Bessie V. Lee, bookkeeping machine operator, has resigned her position to become Mrs. Albert Schencken.

Hugh Henry, popular maintenance foreman at Santa Ana, is the proud father of a dandy boy, Spencer Jackson Henry.

BRIDGE DEPARTMENT NEWS

A. B. Willett has completed his work as resident engineer on the five Imperial County timber bridges, built by Wm. Ledbetter, contractor, and has been assigned to the bridges over San Juan Creek, on the Coast highway, Orange County.

William Carpenter has been assigned to the Klamath River bridge as assistant engineer.

The bridge across Bear Creek, near Briceburg, is now complete and open to traffic. M. J. Dwyer, who was resident engineer on this contract, has resumed his duties in the Grade Separation Division of the Bridge Department.

G. C. Swan, assistant to A. L. Richardson on the Santa Ana River bridge, will be resident engineer on the Pomona bridge, to be built by the Division of Architecture.

W. G. Remington, resident engineer on the San Jose Creek bridge, has taken over the work at Gaviota Creek bridge, succeeding L. De Cew, who has accepted a position with the Engineering Department of the city of San Bernardino.

DIVISION REPORTS

(Continued from page 14.)

Division X forces are busily engaged in regraveling sections of highway in the Mother Lode section as follows:

Keystone to Jamestown, Tuolumne County; Valley Springs to San Andreas, Calaveras County; and Harold to Ione, Amador County. The work is being done to prepare these stretches for oiling treatment during early summer.

Work on the line change at Plymouth, Amador County, is progressing as rapidly as the inclement weather will permit.

Three widening jobs of great interest to the public have been undertaken by Division X. The narrow and treacherous Mokelumne River grade, south of Jackson, Amador County, has been widened to such an extent that two cars may now pass easily at any point, which was impossible before. Blind curves also have been widened and daylighted to allow for greater safety.

Melones grade in Tuolumne County, feared by so many motorists, has been widened and improved so that no one any longer should have any fear about driving over it, regardless of the amount of traffic on the road.

HIGH SEAS AT RINCON—Waves washing over contractor's coffer dam during recent storm. Views demonstrate necessity for strong concrete wall to protect state highway at this point.

THE HIGHWAY STENOG.

The Highway Stenog is the one I would praise
In spite of her odd and stenographic ways;
She types requisitions with requisite speed
And a wrongly spelled word is a small thing indeed.
She's a typographic terror
With a telephonic tongue;
And her style is highly graphic
When it's graphically done.
She handles the keys with careless aplomb
While her pearly white teeth keep time on her gum;
She is seldom in error and never in doubt
And she works (Like the Devil) when the bosses are out.
She's a stenographic marvel
With a stylographic pen;
And she knows her subjects thoroughly
When her subjects are the Men.
She faces exams. with a confident air
For Escher or Stanton have nothing on her;
She's hard to get on with and harder without
And I like 'em all, either tall, short or pleasingly plump.
She's a paragraphic Flapper
With a sophisticated air;
But if you are halfway decent
You can bet she'll do her share.

—W.K.W., Div. VI.

FROM AFRICA AND CHINA.

THE fame of California has traveled far, but it appears that construction and maintenance practices followed by the State Highway Department are attracting equal attention in distant lands. On the same day, recently, the BULLETIN received two clippings, one from *The Standard*, published in Nairobi, British East Africa, and the other from the Shanghai *Mercury*, of Shanghai, China, both quoting the State Highway Engineer of California.

The Nairobi paper republished, in full, a long article telling of the oiling of California highways to eliminate dust and reduce maintenance costs. The item in the Shanghai paper was a discussion of standards of construction.

STATE HIGHWAY FUND CONTRACTS (Bond Funds, Including Federal Aid)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE JAN. 24, 1927.						
------	496	San Luis Obispo	2	F	About 2 miles north of Santa Maria	------	Concrete Girder Bridge	Rocca and Caletti	$126,832 95	April 5, 1926	------
------	498	Imperial	26-27	A, G-C, D, A	Brawley Main Canal, Alamo River; Low Line, High Line and Trifolium Canals	------	Five Timber Bridges	W. M. Ledbetter and Co.	40,181 40	May 7, 1926	------
------	507	Orange	60	A	Branagan	------	Undergrade Crossing	W. M. Ledbetter and Co.	18,669 04	July 14, 1926	------
------	512	San Bernardino	------	------	San Bernardino	------	Division Office Building	George Herz and Co.	31,781 25	July 30, 1926	------
------	514	Yolo	6	C	Between West Sacramento and the M Street Bridge	0.55	P. C. Concrete Pavement	Henry Brown	35,454 60	July 30, 1926	------
					AWARDED SINCE JANUARY 24, 1927—None.						
					PENDING AWARD—None.						

NOTE.—Primary construction covered by the above contracts does not include funds obligated on cooperative forest highway projects, prison camp road activities, or day labor jobs not being done under contract.

STATE HIGHWAY MAINTENANCE FUND CONTRACTS (Including Gasoline Tax Fund)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE JAN. 24, 1927.						
------	M-113	Shasta	3	C	Across Doney Creek	------	Concrete Arch Bridge	Bordwell and Zimmerman	$89,915 63	Mar. 17, 1926	------
------	M-145	Mariposa	18	E	Across Bear Creek 3 miles south of Briceburg	------	Concrete Girder Bridge	Noble Brothers	12,810 94	Sept. 14, 1926	------
					AWARDED SINCE JANUARY 24, 1927.						
------	M-158	San Joaquin	5	B	At the Mossdale Bridge	0.26	Grading	J. E. Johnston	$32,272 99	Feb. 7, 1927	60
------	M-159	San Diego	2	B	At the Carlsbad Overhead Crossing	0.26	Grading and Water Bound Mac. Base	Charles E. Crowley	14,235 75	Feb. 7, 1927	75
					Sub-total	0.52			$46,508 74		
					PENDING AWARD.						
------	------	Kern	4	D	Kern River Bridge at Bakersfield	------	952 lineal feet of Sidewalk		$8,413 31	------	------
					Total State Highway Maintenance Fund Contracts Awarded and Pending Award	0.52			$54,922 05		

NOTE.—The above obligations charged against the State Highway Maintenance Funds do not include funds from these sources obligated for general maintenance and for specific betterments being done under day labor authorization.

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CALIFORNIA HIGHWAYS

A BULLETIN ISSUED BY THE CALIFORNIA HIGHWAY COMMISSION FOR THE INFORMATION OF ITS EMPLOYEES AND THE PUBLIC

Vol. 4 MARCH, 1927 No. 3

FIGHTING THE FORCES OF NATURE—*Above,* concrete seawall at Rincon, Ventura County, erected to protect Coast highway from ceaseless battering of ocean waves; *below,* asphalt concrete pavement on Yuma route across shifting dunes of eastern Imperial; heavy applications of oil on fill slopes prevent erosion of shoulders by wind action. Note old plank road on left.

In this Issue: WHY NOT STATE PLANNING—REVIEW OF PROGRESS DURING THE 1926 CONSTRUCTION SEASON.

CALIFORNIA HIGHWAYS

This Bulletin is published by the California Highway Commission for the information of its employees and the public. Editors of newspapers and others interested are welcome to use, without restriction, any of the matter herein contained. Cuts will be gladly loaned upon request.

FRANK B. DURKEE - - - Editor

P. O. Box 1103, Sacramento, California.

Vol. 4. MARCH, 1927. No. 3

CALIFORNIA HIGHWAY DEPARTMENT

C. C. YOUNG, Governor.

CALIFORNIA HIGHWAY COMMISSION

RALPH W. BULL, Chairman, Eureka

J. P. BAUMGARTNER, Commissioner, Santa Ana

R. M. MORTON, State Highway Engineer, Sacramento

HARRY A. ENCELL, Attorney, San Francisco

E. FORREST MITCHELL, Secretary

HEADQUARTERS STAFF, SACRAMENTO

T. E. STANTON, Assistant State Highway Engineer

L. V. CAMPBELL, Office Engineer

FRED J. GRUMM, Engineer of Surveys and Plans

C. S. POPE, Construction Engineer

T. H. DENNIS, Acting Maintenance Engineer

Bridge Engineer

R. H. STALNAKER, Equipment Engineer

C. L. McKESSON, Materials and Research Engineer

WILLIAM SCHLEIP, Principal Accountant

BEN H. MILLIKEN, Superintendent of Prison Road Camps

DIVISION ENGINEERS

T. A. BEDFORD, Division I, Willits

H. S. COMLY, Division II, Redding

F. W. HASELWOOD, Division III, Sacramento

J. H. SKEGGS, Division IV, San Francisco

L. H. GIBSON, Division V, San Luis Obispo

E. E. WALLACE (Acting), Division VI, Fresno

S. V. CORTELYOU, Division VII, Los Angeles

E. Q. SULLIVAN, Division VIII, San Bernardino

F. G. SOMNER, Division IX, Bishop

R. E. PIERCE (Acting), Division X, Sacramento

General Headquarters, Third Floor, Strub Bldg., Eleventh and P Streets, Sacramento, California.

EVERY employee of the highway commission has a direct interest in the improvement of the highway organization's methods and results, both engineering and clerical, office and field. To that end, the State Highway Engineer invites constructive criticism or suggestions from every employee.

Ideas as to the more economical and efficient handling of your job, or suggestions for elimination of waste will be welcomed. Criticism is also desired from persons outside the organization, who are in a position to give facts.

Send only signed communications addressed as follows: California Highways, P. O. Box 1103, Sacramento, Cal.

PROPOSED SUPER HIGHWAY

SENATOR T. COLEMAN DU PONT of Delaware has introduced in Congress a bill which would authorize a survey of a super-highway from the Atlantic to the Pacific Coasts, the highway to be constructed by a federal corporation to be created for that purpose.

The bill provides that the route of the proposed highway shall be as direct as practicable and that no part of it shall be located within any municipality having a population of 2500 or more. There would be facilities for two-way fast traffic and separate arteries for two-way truck and heavy traffic.

The bill would provide for a right of way of not less than 500 feet and the corporation would be authorized to lease the unused portion of the right of way until needed for road purposes. Senator du Pont estimates that the rentals from these leases will pay the upkeep and operating costs of the highway and eventually provide a balance to be deposited in the treasury of the United States to repay the cost of construction, and ultimately to be a source of income to the United States and the states.

Under the bill provision is made for tourist camps, the establishment and operation of emergency airplane landing fields, radio and other electrical communication facilities for air navigation approved by the secretary of commerce, subject to the requirements of the air commerce act of 1926.

Authority would be granted by the bill to construct, operate, and maintain any part of the highway within the borders of any state by or through the state highway department, state highway commission or other proper state officials.

FEDERAL AID LEGISLATION

W. C. Markham, executive secretary of the American Association of State Highway Officials, makes the following report on progress of federal aid legislation during the session of congress which ended on March 4th last:

President Coolidge on March 3d, signed H. R. 16551. This act authorizes the Secretary of Agriculture to grant federal aid for the building of toll bridges by the states in the same manner as are other federal aid projects under existing legislation, provided the tolls shall only be collected until the sums contributed by the state or by local subdivisions through the state are reimbursed after which the bridge shall be free.

The bill generally known as the Colton-Oddie bill passed the Senate on February 28th. Efforts were made on March 2d, to secure passage in the House but they were blocked by Garrett of Tennessee, Begg of Ohio and Black of Texas.

S. 4602, providing for federal protection of signs on United States highways; and eliminating the 60 per cent restrictions in the use of federal funds on primary roads, was also passed by the Senate on February 28th. It was not brought up in the House.

The Brazilian congress has passed a bill providing an increase in the import duty on gasoline of 60 reis per kilo (present duty 70 reis) and a 20 per cent increase in the present duties on automobiles, omnibuses, trucks, chassis, tires, tubes, motorcycles, bicycles, sidecars and accessories. The proceeds of this increased duty will be used to create a road fund for the construction and maintenance of the highways of Brazil.

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We Have City Planning—Why Not State Planning

CALIFORNIA is faced with the problem of expanding the state highways laterally as well as longitudinally. Not only are our pavements narrow, but we are in possession of thousands of miles of narrow right of way, 60 feet or less in width. Residents of the counties which have heavy intercity traffic know of the inadequacy of the pavement and roadbed widths, and of the program of widening which the state has under way. They can see the territory adjacent to these highways gradually losing its character as open farming land, surrounded by barb wire fences, beyond which is heard each season the hum of the mower and thresher.

The change taking place is the gradual settling up of the land by the additional population flowing into the state, and the expansion of towns to include more territory. The red and yellow flags of the subdivider float in the breeze along miles of landscape, the forerunner of more homes, business buildings, and other intensive improvements. Each flag means a new family, a new dwelling, a new garage and another automobile. Each automobile means more traffic on the highways.

Influence on Highways.

There is not a county in the Sacramento and San Joaquin valleys nor along the coast where the above description is not applicable. Do we realize what this means to the state and the county highway systems?

Due to the wise limitations of the law enacting the present gas tax, the State Highway Commission has, since 1923, been engaging actively in the widening and reconstruction of state highways. Much of this work has been concentrated around those centers of population where traffic has already overrun the previously built improvements. Therefore, the state's engineers are acutely aware of the changing status of our agricultural land. **We have seen many miles of state highways change in character from rural roads to city streets.**

The realization that this change is taking place more or less rapidly adjacent to many of our highways, resulted last year in the initiation of a study by our department to establish ultimate widths for each mile of state highway. This study is already bearing fruit, and we are beginning to crystallize our ideas in various locations as to what the state highway will have to be ten to fifteen years hence.

Wider Rights of Way Needed.

The main feature of this study, in so far as the present discussion is concerned, is that we know definitely that a 60-foot right of way will be insufficient to carry state highway traffic. Many of our main highways should ultimately have not less than 56 feet of pavement and probably they will be curbed and guttered. On a 60-foot right of way, this leaves two feet on each side for the placing of power and telephone poles, trees and sidewalks. This is impossible on 60 feet. **Therefore, we have determined that an 80-foot width of right of way is the least which should be accepted by the state. In many locations, a greater width should be acquired.**

This brings us to another angle of the matter—that is, the use made of the land adjacent to our 60-foot right of way.

The red and yellow flags of the subdividers are a trouble signal to the highway officials. At the 1925 session of the legislature, we endeavored to have passed an amendment to the subdivision act which would make it mandatory upon those subdividing land fronting on a state highway to obtain the approval of the State Highway Engineer prior to the filing of the map with the county board of supervisors. This bill was lost in the legislative shuffle, and never became a law.

We therefore launched a program of soliciting the cooperation of the boards of supervisors in aiding us to safeguard the future of the state highways by refusing to accept for filing maps of subdivisions fronting on a state highway, which had not been previously approved by the highway commission. Every county board was notified of this desire on the part of the highway commission, and we asked each county board to pass an appropriate resolution agreeing to such a procedure. We are glad to state that many of the counties, during 1925 and 1926, passed such resolutions, and, as a result, we have made considerable progress in obtaining the necessary increased width **opposite subdivisions.**

However, the situation is not always one that can be handled simply by an expression of desire on the part of the board of supervisors or on the part of the highway commission. While most subdividers are willing and anxious to cooperate with the officials who have to approve their maps, yet occasionally one is encountered who resents the interference. He is interested only in getting his map filed, and legally, he may be entitled to it. When an array of legal talent tells the board what their duty is, and when the district attorney can not advise the board otherwise, the supervisors are up against a hard question in refusing to accept subdivision plats for filing.

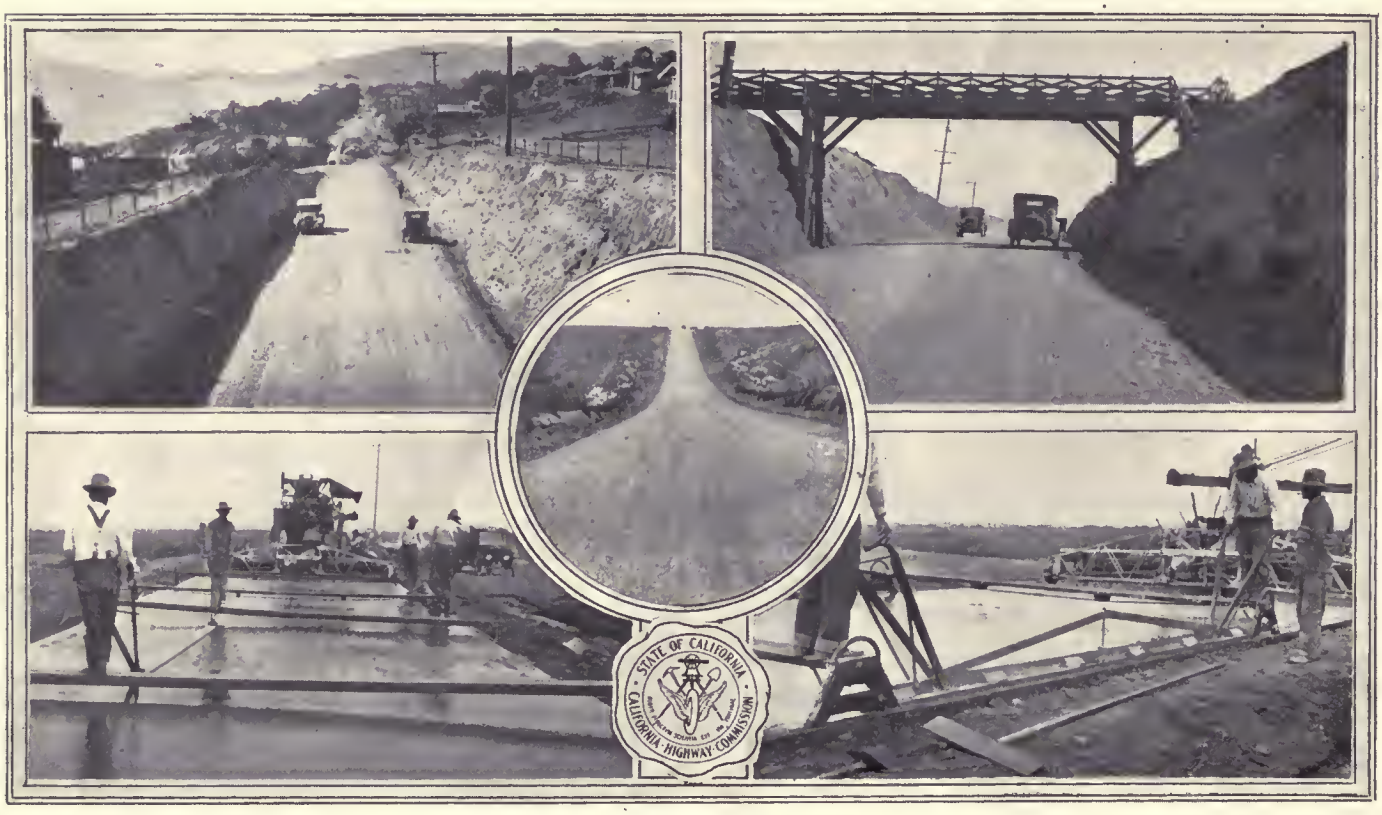
The section south of the Tehachapi does not have all the subdivisions; land adjacent to the state highways is being subdivided and sold everywhere, even in the remote northern sections. Only recently an active subdivider was able to convince a northern board that legally he was entitled to have his map filed. The state will probably have to take drastic steps in this case to obtain title to the land needed for widening the highway before the lots pass into the hands of a hundred different owners, and become built up with business blocks.

The commission is trying to develop a plan for the whole State of California. The relocation, realignment and widening features of our state highways all are a part of a magnificent scheme of boulevards which will gradually be finished and turned over to the traffic of California motorists and visitors from without the state, and to commercial vehicle traffic which is of increasing importance from the development standpoint.

Planning for the Future.

California cities are spending thousands of dollars for expert advice to secure plans for their future orderly growth and expansion. And in working out these plans one of the most difficult problems encountered is adequate provision for handling traffic—the problem of the motor vehicle. Millions of dollars are being expended for the widening of streets and

NEWPORT-LAGUNA BEACH COAST HIGHWAY VIEWS



NEW TRAFFIC ARTERY IN ORANGE COUNTY—*Upper left,* cut on new approach to Laguna Beach; *Upper right,* safety pedestrian crossing over highway built by commission; *Lower views,* finishing concrete on Newport-Corona Del Mar unit, smoothest section of pavement on state system; *Insert,* typical section of rock-surfaced highway on unpaved portion of recent contract.

boulevards, much of which could have been saved by a little systematic planning a few years ago.

But the cities are not alone in realizing the necessity for planning future development. We have county planning commissions and regional planning commissions, such as the organizations now functioning in Los Angeles and vicinity and in the bay district. It is but a step farther to an adequate state-wide traffic plan. Without realizing it, the highway commission has had forced upon it the duty of developing such a plan. But it is without adequate authority of law to properly undertake the responsibility. The urban centers are not the only areas in the state with traffic problems; every trunk line highway in California is carrying an ever increasing volume of traffic which must be cared for. **Due regard for the future welfare of the state, demands that we begin now to plan for the future of the highways as a state-wide traffic system. Delay means needless burdens upon the taxpayers of the future.**

In proposing a legislative measure, to facilitate securing of adequate rights of way, it is not the intention of the commission or its officials to confiscate land. The state and the counties are willing and able to pay where damage is done. In nine cases out of ten, the subdividers themselves see the financial self advantage of setting aside the width necessary to make a wide boulevard past their property. We will take our chances with the subdividers on the question of payment for the land involved and it will never be the policy of the state to strongarm anybody into donating right of way at a personal loss.

Accomplishments in this direction can already be seen in many counties. In San Luis Obispo County north of Pismo is an example of what has been done through the cooperation of the board of supervisors, our division engineer, and the subdivider. On the section between San Jose and San Francisco, in both Santa Clara and San Mateo counties, are several examples of provision being made by the subdividers for a future wide boulevard. On the Ventura boulevard north of Hollywood in Los Angeles County for long stretches we are not only cooperating with the subdividers in the setting aside of land for a wider street, but we have agreed to defray a certain portion of the street building cost, whenever the abutting property is organized to handle their share. Similar examples are found in San Diego County between San Diego and El Cajon.

We take the progress which has been made in this regard without express authority of law as evidence of the understanding of the boards of supervisors of the necessity for a state-wide boulevard plan, and as an example of what can be accomplished in this direction through cooperative efforts of public bodies.

The burden in this matter should not be carried by the boards of supervisors. We believe it to be highly desirable that proper laws be enacted which will place on the subdivider the burden of conforming to the plans for ultimate development formulated by the State Highway Commission.

Almost every growing town in the state has felt the necessity of a coordinated plan for city development. Why should not the state and the counties have a coordinated plan for highway traffic development? We have city and county planning, why not state planning?

INCREASE IN SURFACE SMOOTHNESS IS MOST IMPORTANT IMPROVEMENT IN 1926 CALIFORNIA PAVEMENTS

Reported by EARL WITHYCOMBE, Assistant Engineer, Construction Department.

A GENERAL increase in surface smoothness was the most important improvement accomplished during 1926 in the construction of California state highway pavements. This is the report of the Construction Department following a careful review of all projects placed under contract during the past season. Improvement is shown in both asphalt concrete and cement concrete pavements, which means not only improved riding qualities but less traffic impact and longer lived state highways.

Advantage has been taken during the year of every opportunity to improve construction practices and to better results by revisions of the specifications. Constructive criticism has been encouraged; and much credit is due the engineers in the field for suggestions and ideas that have contributed materially to the results of the year's work.

The following review of 1926 California state highway paving projects will be of interest to engineers:

Construction Methods.

PORTLAND CEMENT CONCRETE. Finishing of cement concrete pavements has been standardized by the adoption of the pliable wooden longitudinal float. This float, which replaces the push float, canvas belt, and rubber hose for final finishing, was introduced in California by Construction Engineer, C. S. Pope, and was developed largely by Resident Engineer, W. D. Eaton, of Division VII.

During the 1926 construction season, longitudinal joints have been built on almost perfect alignment and free from subsequent spalling by the development of what is known as the weakened plane type. This joint was introduced on state work by Division Engineer S. V. Cortelyou of Los Angeles and was perfected by Resident Engineer Eaton. It is made by driving a groove two inches in depth in the surface of fresh concrete on the center line of the pavement. Finishing is done with a hand tool that acts as a combined double edger and groover. This groover is handled in somewhat the same manner as the walking edger, a tool used adjacent to the side forms.

On second-story work this method of making the longitudinal joint has the added advantage of not leaving any unnecessary material in the slab. In the thickened center type of the pavement, to reduce the area of unbroken concrete, a wooden strip ½" by 4" is fixed in a vertical position on the subgrade directly under the line of the proposed groove. The groove is poured with asphalt to form a traffic guide line before the pavement is opened to traffic.

Expansion joint intervals have been reduced to 50 feet, and, in special cases, to 25 feet, without sacrificing any of the normal riding qualities of the pavement. This has been accomplished by the use of a prepared joint material, held in position during the placing of the concrete by means of steel plates cut to cross section in one continuous piece and suspended from the side forms. The joint material is slightly submerged to permit unbroken, continuous finishing. Desired alignment is secured immediately following the removal of the steel plates by truing up the joints to a chalk line.

To control the unsightly cracking which sometimes results from contraction, intermediate weakened plane transverse joints are now being placed between the regular expansion joints. Such weakened joints are made by driving an oiled steel plate, two inches in depth, to slightly below the surface of the freshly placed concrete. Finishing is carried on over the joint and edging is performed after the concrete has sufficiently set. Generally the plates may be removed after four hours. The opening is always filled with asphalt before the project is opened to traffic.

All regular expansion joints are now being doweled to prevent subsequent settlement at the ends of slabs.

A 5-mile section of pavement was built during the 1926 season in Ventura County with experimental sections of reinforcement. This project is described in detail in a special article on page nine of this issue.

No change was made during the year in the method of reinforcing second-story pavement of 20-foot width. Such slabs still carry bar or mesh reinforcement over the edges

(Continued on next page.)

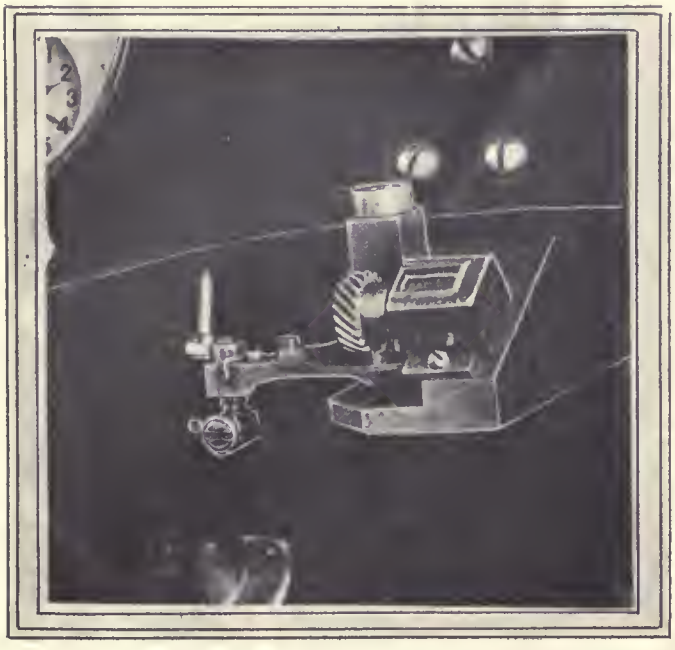
1926 CONSTRUCTION.

Division	County	Route	Section	Contract	Miles	Contractor	Resident Engineer	Ave. Strength of Concrete at 28 days, lb. sq. in.	Vialog Index of Roughness, Inches per mile	Ave. Interval of Designed Joints, ft.	Ave. Interval of Joints and Cracks, ft.	Ave. Variation in Cement Used per Day, %	Ave. Relative Specific Gravity, in %	Ave. Yardage or Tonnage Laid per Day
PORTLAND CEMENT CONCRETE PAVEMENT.														
IV	Sonoma	1	B	M-90 Ex	5.95	J. V. Galbraith	M. C. Fosgate	4,861	5.9	48.0	43.6	1.23		208
IV	Sonoma	1	A	510	1.25	J. V. Galbraith	M. C. Fosgate	5,158	5.0	47.2	45.8	1.79		167
VII	Los Angeles	2	D	M-85	3.20	Kuhn Bros.	A. N. George	3,885	11.2	83.8	55.6	1.60		224
VII	San Diego	2	C & D	M-93	14.20	Jahn & Bressi	W. D. Eaton	4,092	7.4	90.5	76.2	1.40		232
VII	Los Angeles	2	D	M-97	1.90	J. P. Benson	A. N. George	3,144	9.2	82.2	78.5	2.64		152
VII	Ventura	2	B & C	M-106	10.20	H. H. Peterson	A. D. Griffin	3,625	6.9	86.3	42.1	1.31		206
VII	Orange	60	B	479	3.90	Kavanagh & Twohy	R. L. Thomas	5,304	4.8	82.3	78.5			212
VII	Los Angeles	60	A	487	6.15	Ed. Johnson & Son	C. P. Montgomery	5,027	4.1	65.5	54.3	1.52		190
VII	Ventura	60	A	513	5.00	United Conc. Pipe & Constr. Co.	A. D. Griffin	4,415	5.8	29.7	29.7	1.20		157
VIII	Riverside	26	B	M-105	3.00	Geo. Herz & Co.	R. C. Payne	3,800	15.4	101.0	40.6	0.90		202
X	Yolo	6	C	514	0.50	H. Brown	C. A. Potter	3,958	6.5	45.9	45.9	1.31		62
PORTLAND CEMENT CONCRETE SHOULDERS.														
IV	San Mateo	2	B	M-137	0.25	Municipal Imp. Co.	H. S. Payson	3,920	9.4			2.00		150
V	Santa Barbara	2	H	M-109	1.05	Cornwall Constr. Co.	E. B. Brown	2,110				1.20		60
V	Santa Barbara	2	K	M-122	1.00	Cornwall Constr. Co.	E. B. Brown	3,506	3.5			1.64		90
V	San Benito	22	A	M-124	6.90	Granite Constr. Co.	R. S. Badger	3,886				1.24		85
VI	Madera	4	A	M-120	2.09	Hanrahan Co.	P. L. Wilcox	3,254				1.73		34
VII	Los Angeles	9	A	M-101	15.10	Dewey & Rawson	J. B. Hodges	3,833				1.87		104
VIII	Riverside	26	E	M-96	11.43	Basich Bros.	J. M. Hollister	3,997				1.09		174
VIII	Riverside	26	D	M-126	17.30	Matich Bros.	R. C. Payne	3,934				1.63		154
X	Stanislaus	4	B	M-119	7.90	Valley Paving Co.	C. A. Potter	4,099				0.75		92

of the old pavement in the outer four and a half feet. On new work it has been the practice to reinforce the entire slab in areas where subgrade conditions are questionable.

A marked improvement has been made in the method of placing reinforcing steel by the use of a new device designed and patented by Resident Engineer Eaton. This device (described in the November, 1926, issue of the California Highways, page 11) suspends rather than supports the steel to insure its proper place in the slab. After the concrete has been placed the supporting device is removed, leaving no unnecessary material in the pavement.

Concrete for California pavements is now being designed in the field to conform to the requirements of the particular materials available for use on the basis of the maximum density methods perfected by Construction Engineer Pope and Materials and Research Engineer C. L. McKesson. All



New type of vialog and recording device now in use by Construction Department for measuring pavement roughness

mixtures are similar in that the ratio of cement to volume of concrete in place is constant.

No wide departures have been made with respect to equipment, except that on one project two mixers were operated opposite each other on the shoulders to pour a 20-foot slab. On pavement widening, where a centrally mixed concrete can be used to advantage, a new type of plant with a pug mill mixer has been perfected. **From the result of tests made on this plant the usual mixing time of 60 seconds has been reduced to 45, with indications that the time may be reduced still further due to the rapidity of pug mill mixing.**

The policy of the department is to allow the contractor or equipment manufacturer to operate any mixer in a manner other than that called for by the specifications, provided the strength of the resulting concrete, as determined by compression tests, is equal to that produced with the equipment operating in the manner specified.

ASPHALTIC CONCRETE. Increase in smoothness of asphaltic pavements was accomplished solely by constant vigilance on the part of the field forces, as no changes in methods of finishing such pavements were made during the year. (A mechanical method of finishing similar to that in use on Portland cement concrete has been experimented with recently on other public work in California, and, although it is not, as yet, a complete success, the results indicate future possibilities.)

Results of experimental work in 1925 with mixtures containing a high percentage of limestone dust filler are encouraging. These studies were continued during the past season on four projects of considerable length in widely separated sections of the state. On these jobs pavements were placed with an increase of 50 to 75 per cent of filler over the normal amount required in the standard California mix for asphalt concrete.

The former practice of sealing the surface of asphaltic pavements with a coat of hot asphalt covered with hot stone chips has been discontinued, due to the slipperiness in wet weather of the resulting surface. Many pavements have been laid successfully simply by rolling hot stone chips into the freshly compacted open top surface.

During the past season another type of nonskid surface, giving much promise of permanent success, was laid on a number of projects. Hot stone chips, previously coated in the pug mill mixer with from 1½ to 2 per cent asphalt were applied to the surface and rolled in immediately after initial compression. Because of the dryness of the mixture now in use, it appears unlikely that this type of finish will be driven into the surface for some time. The nonskid qualities of this type of asphalt pavement finish, at the present time, are, apparently, superior to those of any other type. The department is indebted to Construction Engineer Pope for the introduction of this idea in California and to Resident Engineer H. B. La Forge for the field adaption. (For description of such a project see California Highways for December, 1926, page 6.)

No radical changes have been made in equipment in use on asphaltic concrete construction. Minor improvements have been made on mixing plants, the most notable of which is a lime dust proportioning device perfected by the Cornwall Construction Company of Santa Barbara. At this plant, lime dust is proportioned by weight on the ground level and conveyed to a storage hopper alongside the aggregate box from which it is shot into the center of the mixer along with other aggregates. This gives a maximum of efficiency with a minimum of labor. Asphalt plants, manufactured in California, have been perfected to produce 400 tons of mix per day with but one operator necessary on the platform.

Experiments during the season with the mixing time of asphaltic concrete in pug mill mixers led to a reduction in duration of mixing from 60 seconds per batch to 45 seconds. This has materially increased the average daily production which is being reflected in decreased bid prices.

Results of Laboratory Analyses.

PORTLAND CEMENT CONCRETE. The average compressive strength of all Portland cement pavement and shoulder concrete for the 1926 season was 4145 pounds per square inch at 28 days. The mix was the California Highway Commission standard class "A," or six sacks of cement per cubic yard of concrete. Individual full width pavement strengths varied from 3144 pounds to 5304 pounds per square inch, while shoulder concrete ranged from 2110 pounds to 4099 pounds per square inch.

Wide range in compressive strengths is due somewhat to differences in structural strengths of aggregates from various sources and to a slight variation in strengths of cement.

ASPHALT CONCRETE. A change has been made in the laboratory method of determining specific gravity of compressed asphaltic pavements. Determination is made of the sample as received; it is broken down and the specific gravity is expressed as a percentage of the composite specific gravity of the aggregates. By this method the voidage in the pavement sample is made apparent at a glance.

Voids in surface mixtures laid during 1926 ranged from 4.2 per cent to 0.6 of one per cent, indicating that a remarkably dense and impervious pavement has been secured. Voidage in these mixtures is but one-third of that in present Portland cement concrete.

Field Comparison.

PORTLAND CEMENT CONCRETE. Surface roughness on cement concrete pavements, as determined by the vialog, decreased during the year from an average of 14.3 inches per mile in 1925 to 7.1 inches per mile in 1926, or 50 per cent. Credit for this result is due to careful field inspection and control and to the improved methods worked out for making the final finish.

A new type of surface finish also has been adapted on concrete shoulder construction with an exceptional increase in surface smoothness. The 1925 average of 26.7 inches of roughness per mile for shoulders was reduced, in 1926, to 4.7 inches per mile, a decrease of 82 per cent.

Early comparisons of crack intervals on newly constructed pavements has not been accepted as a correct indicative of the relative merits of the projects, with respect to resistance to cracking from temperature changes. A progressive study of the yearly condition is now believed to be the best index of this quality.

(Continued on page 13.)

DIFFICULTIES OVERCOME ON SACRAMENTO CANYON PROJECT

PACIFIC HIGHWAY RELOCATION—Views on Pollock contract in northern Shasta County; *above,* curves and grades to be eliminated by construction of high arch bridge position of which is indicated by dotted lines; *left,* masonry retaining wall on new section; *center,* position of Harlan D. Miller bridge across canyon of Dog Creek; *right,* section of finished highway eliminating sharp curve; *below,* relocation across Slate Creek at La Moine; upper line shows grades and curves of old road; lower line is new location which saves three-quarters of a mile of distance at this point; Sacramento River in foreground.

Reported by E. J. Bassett, Resident Engineer, Division II.

ANOTHER section of superb mountain highway—the Dog Creek-La Moine unit in the Sacramento Canyon—soon will be ready for acceptance by the California Highway Commission. This unit of 4½ miles is the third major reconstruction project to be undertaken in the canyon and its consummation will bring the mileage of highway reconstructed between Redding and Dunsmuir to approximately 59 per cent of the total.

The present contract, which has included some of the heaviest yardage on the Pacific highway in California, has been prosecuted on the same bold standards of alignment and grade that have made the work in the Sacramento canyon one of the outstanding reconstruction projects of the state. Completion of the great arch bridge over Dog Creek, scheduled for early in July, will make the entire 4.5 miles of the Dog Creek-La Moine contract available for traffic and will effect a saving of 1.06 miles in distance as compared with the existing highway.

The contract will carry the relocation work through one of the most rugged parts of the Sacramento Canyon. The final reports will show the excavation to be approximately 54,000 cubic yards per mile. Elimination of a mile of light work, shows an average of 63,000 cubic yards per mile for the heavier sections.

The excavation was all accomplished with power shovels. Two of 1¼-yard and one of ¾-yard capacities were used, the smaller one being used principally on quarry work and slide removal. The average output for the two 1¼-yard shovels for five months' operations was 20,000 cubic yards per month each, or about 350 cubic yards per 8-hour shifts. The work was double shifted.

The existing road has been widened and straightened from a 16-foot to a 24-foot roadway with minimum radius curves

of 300 feet, and a maximum gradient of 6 per cent. A 6" x 20' crushed rock surface also has been placed.

The great improvement in alignment over the existing highway will be appreciated by an examination of the following comparative tabulation:

	Curves under 300' Rad.	Curves 300' Rad. or over	Curvatures in degrees	Total distance
Existing highway----	69	21	4386°	29,775 Ft.
Reconstruction -----	1	40	2037°	24,153 Ft.

It will be noted that in 5½ miles on the former location, 1.06 miles in distance has been saved, while the number of curves has been reduced by more than one-half.

The topographical features of the canyon on the section covered by the Pollock contract made possible two line revisions of considerable magnitude, which depart radically from the old location and effect not only betterments in alignment, but a reduction in both adverse grade and distance.

The first of these changes is at the southerly end of the project. The new location swings away from the old road and drops down along the face of a rocky bluff to the southerly slope of Dog Creek, where prominent rocky formations draw the canyon into a deep, narrow gorge, an ideal location for an arch span. It is here that the Harlan D. Miller bridge, a handsome concrete arch structure, is now in course of construction. Long sweeping curves and nearly half a mile of flat tangent were possible on the new locations, against minimum radius curves, longer grades, uniformly heavier quantities, and 71 feet of additional rise and fall on the alternative route through Dog Creek canyon, the original location.

Of particular interest in connection with the new construction at this point, is the 550 feet of grade immediately south of the bridge crossing. The new line at this location is 60 feet below the old road and on the face of a nearly perpendicular bluff of lava basalt which overhangs the tracks and bridge of the Southern Pacific Railroad. **The near edges of the two roadbeds are separated but 90 feet horizontally and 125 feet vertically. The roadway for a distance of 450 feet is entirely in solid rock, and for the remaining 100 feet it is partly in embankment which is retained in place by a 23-foot masonry wall.**

Quantities in this cut totaled 12,750 cubic yards which was all waste. An average cut of 45 feet was required on the inner slope to secure an excavated width of 33 feet. To insure against slides and erosion of the slope between the highway and railroad, drainage is to be carried for 1150 feet in a gutter against the inner slope. Storm water from the mountain above the new construction will intercept on the old road above and be carried to a safe disposal, which puts to useful purpose the original grade. Progress on this cut has been slow, due to the fact that the excavated rock is being crushed in a nearby plant for surfacing the new grade. Occasional damage to the railroad tracks and to signal and telephone lines have marked the progress of the work, but, up to the present, no serious results have been occasioned by the blasting or shovel work.

Parking Space Planned.

At northerly end of this cut overlooking Dog Creek canyon and the Miller bridge, the Bridge Department has designed an ornamental rubble masonry observation bay and parking space. It will be flanked by an ornamental coping along the outer edge of the roadway, where motorists may stop to view the work of both nature and man. In three directions are vistas of river, canyon, railway and highway, all overshadowed by towering mountains.

At the northerly end of the project, near La Moine, a new crossing of Slate Creek involves a relocation slightly over a mile in length. On this section, the old highway loops and winds along the canyon slope on a level grade for a half mile and then dives downward to cross far upstream, winding back to a point opposite the beginning of the descent. (Such locations are characteristic of most of the side canyon crossings throughout the original location in the Sacramento Canyon.)

The new location begins to descend far back on the contour section and follows a moderate grade to a lower crossing of Slate Creek near where it empties into the Sacramento River. Beside accomplishing a more moderate grade and easier alignment with better visibility on curves, this line lessens the distance ¾ of a mile.

As the total estimated saving in distance by the reconstruction of the highway through the Sacramento Canyon is 6.5 miles, the value of the La Moine-Dog Creek line change is readily seen. The saving on this one project is in excess of 11 per cent of the total. Only 2.25 miles of the unit is now open to travel because of unfinished bridges. Midsummer, however, should see the public enjoying the use of the completed structures and reaping the benefit of the improvements accomplished on the relocated highway. The contractor is the George C. Pollock Company of Sacramento.

WORK OF THE STORM

STORM DAMAGE IN DIVISION VII—*Above,* washout on Whittier boulevard in Los Angeles County; *center,* Santa Margarita River, San Diego County; state highway bridge, at left, intact but approaches damaged; *below,* on the Los Angeles-San Diego highway near Capistrano, Orange County.

COMMISSIONER IS SPEAKER.

Commissioner J. P. Baumgartner was one of the speakers recently before the annual convention in Sacramento of the County Supervisors' Association of California. He explained to the convention that a lack of finances will make 1927 one of the smallest construction years in the history of highway building in California, but predicated a resumption of work when the proposed Breed bills have become law. He also pointed out that maintenance and reconstruction have been generously cared for in the current budget of Governor Young.

Experimental Pavement Sections on Oxnard Route

Reported by A. D. GRIFFIN, Resident Engineer, Division VII.

A NEW SECTION of California state highway which in the years to come may take its place among the famous experimental highways of the country has just been completed on the Oxnard coast route in Ventura County, Division VII. (Contract 513, VII Ventura 60 A; Oxnard to Hueneme road). The type of pavement placed is cement concrete, 20 feet in width, the contract including also roadway grading and drainage structures.

The five miles of pavement comprise the connection between Oxnard and the coast in the direction of Point Mugu. The entire section is on new location through highly productive bean and sugar beet land on almost a direct line, shorter by two miles than the existing county road. The flat grades and straight alignment, with no breaks in the continuity of the pavement, and the almost uniformly sandy soil subgrade, presented an ideal opportunity for the Construction Department to work out its experimental sections.

The contract provided for twenty-one different pavement designs **with respect to steel reinforcing and transverse joint spacing.** Unlike the test roads at Pittsburg, California, and Arlington, Virginia, the Oxnard pavement has been built for practical every day use on a route that is certain soon to have a heavy traffic at all seasons of the year. The effect of this traffic on the various experimental sections should in time demonstrate which is the better design for the reinforcing of concrete pavement, and should provide highway engineers with information which will be valuable in the future in the refinement of pavement specifications.

It should be understood, however, that as far as the pavement as a whole is concerned there has been no radical departure from accepted practice; that the state's investment in high class concrete pavement has not been jeopardized.

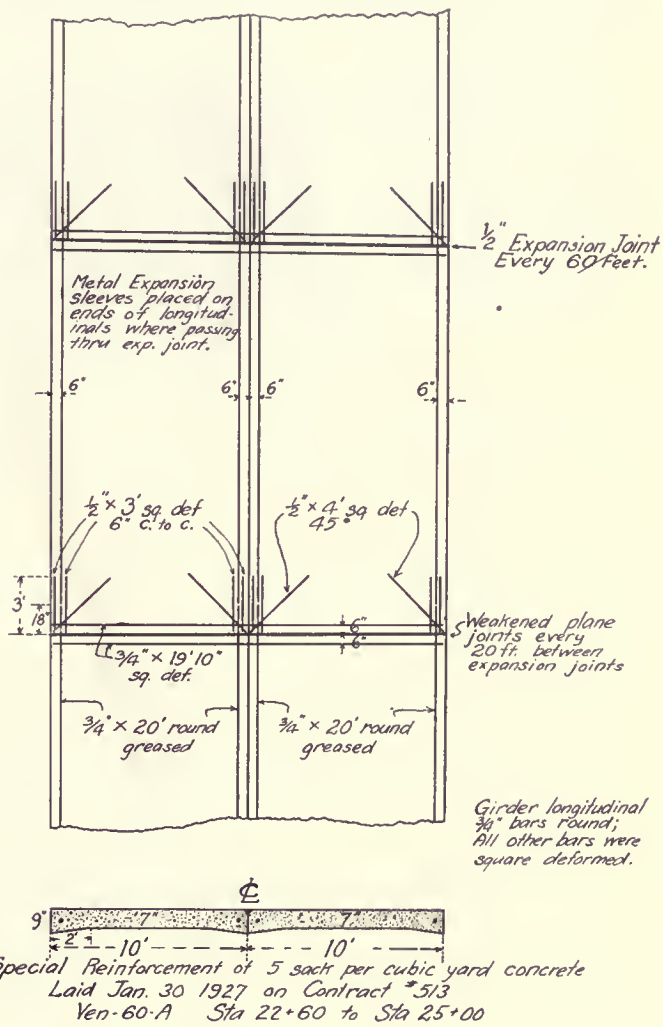
Because of the interest which has been taken in the effort of the Commission to initiate a comprehensive study of the reinforcement of cement concrete pavements, Resident Engineer A. D. Griffin has endeavored to present considerable of the details of the project. It is his thought that the following descriptive matter may be used as guide for subsequent inspections by interested engineers, who may not have easy access to official construction records.

INTRICATE PAVEMENT DESIGN. The pavement design, as may be observed from the accompanying chart and construction detail sheet, changed every 1200 feet, except for two longer sections at the beginning and end of the contract. Arrangement of the different sections is such that any effects due to possible variations in quality of the subgrade, or a heavier traffic in one direction than in the other, will balance one another, when the results for the entire five miles are combined and compared.

The centerline V-groove under which is placed a submerged wood strip and the transverse dowelled expansion joints, as used on this contract, are now standard California practice. The weakened plane transverse joints, to afford relief for tensile stresses by encouraging and localizing contraction cracking, are a new procedure, although a development of the same idea has been used by the city of Seattle. The concrete mix was all standard Class "A," six sacks of cement to the cubic yard, except for a short section which is subsequently described.

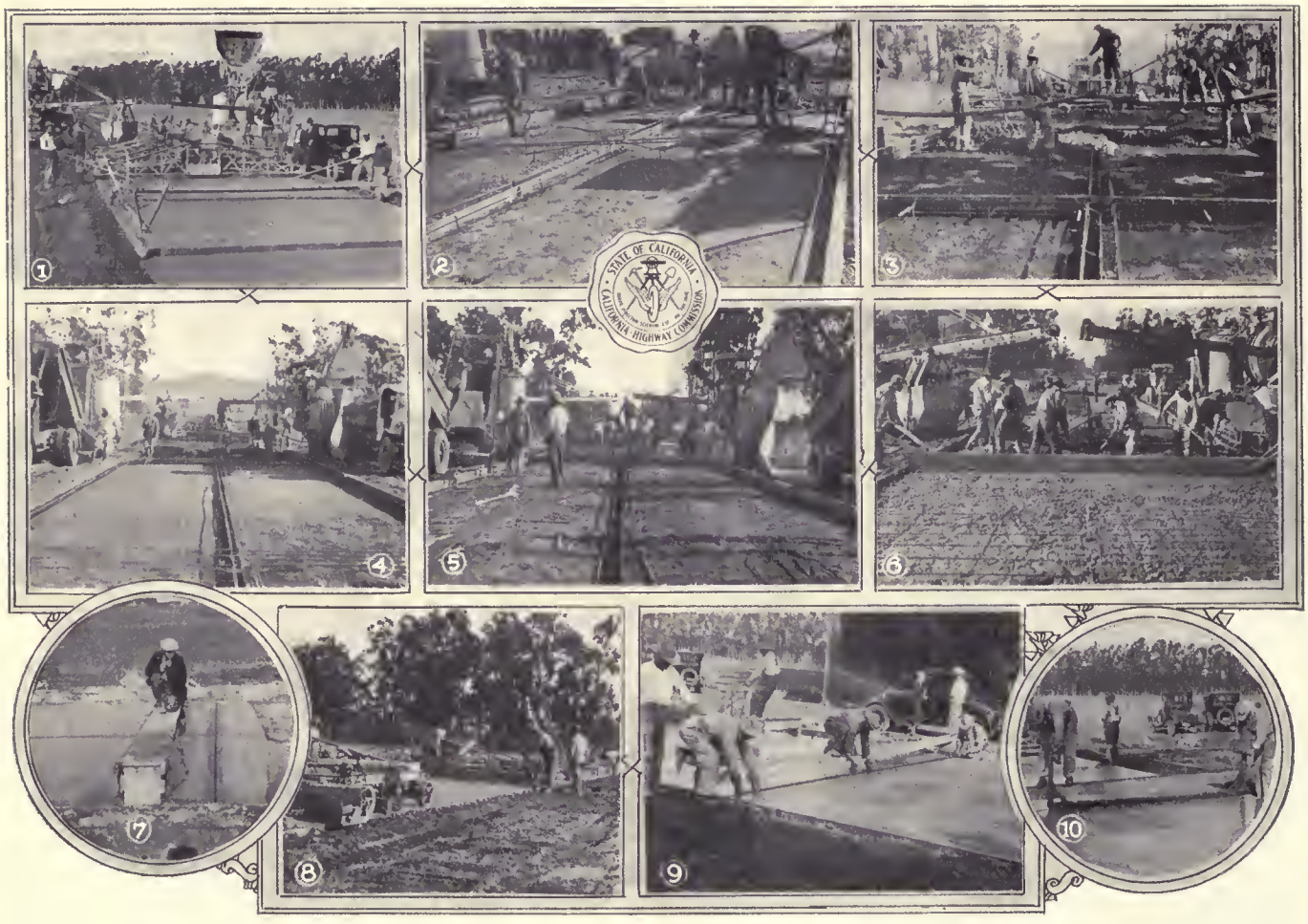
To guard against corner cracking where longitudinal edge and center bars were specified, the same type of reinforcing was carried transversely across the slab parallel to all expansion joints, except where slab reinforcement was used, when the precaution was considered unnecessary. A break in the longitudinal steel was always provided at all transverse expansion and weakened plane joints; no steel passed through the joints except the ¾" x 24" steel dowels. These were placed with slip-sleeves on one end to provide space for expansion. Ten dowels were used in each of the expansion joints, and four dowels in each of the weakened planes. In the latter instance the dowels were spaced 6" from the edges and center of the pavement. Dowels were held firm by wiring them to steel pines, ½" x 12", which were driven into the subgrade as supports. Placing of dowels was given particular attention throughout the project.

CONTRACTOR'S CONSTRUCTION PROGRAM. N. L. Basich and R. H. Richards, who represented the contractor, the United Concrete Pipe and Construction Company, appreciated the fact that the contract was unique in its variety of exacting requirements. They realized also the disadvantages of the usual method of hauling concrete paving materials and of conducting mixing operations on a subgrade composed of the prevailing sandy soil. Earth structures, 10 feet in width, had been planned for either side of the 20-foot pavement, which permitted two 5-sack mixers to be operated opposite each other, and entirely outside the pavement side forms.



Pneumatic-tired dump trucks delivered proportioned batches of rock and sand from the Saticoy Rock Company. All traffic was kept entirely off the subgrade, the hauling being done either along the shoulders or in the side ditches.

This arrangement made possible the lining up of pavement steel and transverse joints well in advance of the placing of the concrete. It also diminished confusion around the mixers and made for better progress. To further speed up operations, the contractor provided two Lakewood tampers which



EXPERIMENTAL SECTIONS OXNARD PAVING CONTRACT—(1) double mixer operation; (2) holding steel reinforcing with iron pins; (3) holding steel with movable braces; (4) holding steel with specialy fabricated wire supports; (5) ½-inch steel bars held in place by wire wickets; (6) placing slab reinforcement by two-course method; wire mesh on half width, with ⅜" square deformed bars on other 10 feet; (7) completed transverse weakened plane joint after edging and pulling of plate; (8) two tampers in operation; (9) submerging ¼" x 1½" by 19' 10" steel plate; finishing to be carried over top; (10) impressing V-groove tamper for a transverse weakened plane joint.

worked in conjunction with one another, except for short periods when repairs were necessary.

When weakened plane joints were being placed nine finishers were required to take care of a normal day's run. Adverse weather conditions prevented any record of exceptional progress on the job as a whole, but on many days over 400 cubic yards of pavement were placed. This is better than 900 linear feet.

STEEL REINFORCEMENT. Three methods were used for the support of longitudinal steel bars in the pavement slab:

(1) ½" x 12" steel pins which were driven into the subgrade and to which the longitudinal bars were wired;

(2) Movable braces, an invention of the contractor, which were taken out after the concrete had been spread and which were then reset;

(3) Stiff No. 8- or No. 10-gauge wire supports, bent and welded with stop bars and hooks, which were driven into the subgrade and the headers and left permanently in place.

The last mentioned method proved by far the most satisfactory. The wire supports made possible setting of the reinforcing well in advance of placing of concrete. The bars were held firmly in place not only vertically and horizontally, but also longitudinally which is particularly important where breaks in the reinforcing steel must be accurately spaced for weakened plane transverse joints. The wire supports when left in place also insured against movement of the reinforcing steel during tamping operations. All other methods of steel support have obvious disadvantages.

When slab reinforcement was accomplished with wire mesh or ⅜" steel square deformed bars, the procedure was as follows:

A layer of concrete was struck off with a template at the depth at which the reinforcement was to go for the full distance between expansion joints. The wire mesh sheets or the previously made up mats of steel bars were then placed and wired to position. The mixers were moved back and the top layer of concrete was deposited, tamped, and finished in the usual manner. Of the various methods tried other than the use of wire supports, the placing of the concrete mix in two layers appeared to give the best results from the standpoint of getting and holding the steel in its proper place. To meet objections to this procedure, dusty side roads were sprinkled, the first course of concrete on hot days was run slightly wetter, and burlap mats were provided on which workmen wiped their feet to avoid tracking dirt onto bottom course of freshly laid concrete while placing the steel.

WEAKENED PLANE TRANSVERSE JOINTS. Considerable difficulty was experienced in the construction of transverse weakened plane joints. The special provision of the contract showed the transverse V-groove to be the same as the longitudinal center-line V-groove. An effort to follow this requirement indicated that the resulting transverse joint would not be smooth; a clean-cut V-groove by this method seemed impossible of construction without making an objectionable depression.

A method developed by Resident Engineer E. B. Brown, of Division V, for shoulder construction, was enlarged upon and was finally adopted for full width pavement. Under this plan the V-groove tamper was impressed in the concrete after the heavy longitudinal float had passed. In this groove a ¼"x 1½"x 19' 10" steel plate, bent to roadway crown, tapered, and drilled with holes near the top to facilitate pulling, was placed about ¼" below the surface of the concrete. Longitudinal floating was then carried on until the pavement over the plate was as smooth as elsewhere. After the concrete had dried out sufficiently, an edger was run along both

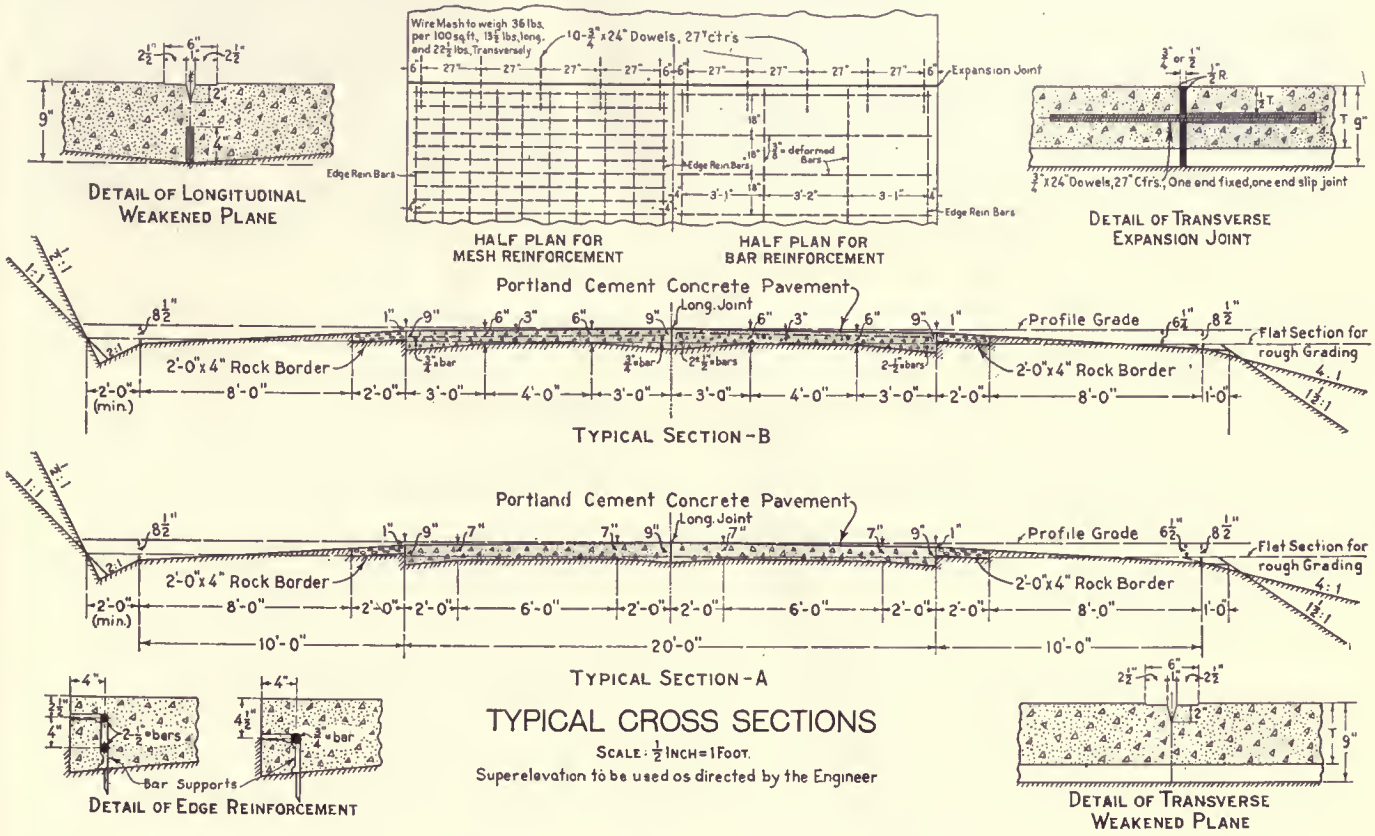
sides of the plate, giving it the appearance of an expansion joint. After about four hours the concrete was generally hard enough for the plate to be pulled and used over again. Great care had to be taken to keep the plates scrupuously clean and well oiled, as otherwise corners would be broken off in the pulling.

DEPARTURES FROM PRESCRIBED DESIGNS. Between Station 22+60 and Station 25+00, a part of typical section "A," the Construction Department directed that the concrete be poured five sacks to the cubic yard instead of six. Special reinforcement also was used as shown by the accompanying sketch. The ¾" smooth round longitudinal bars used on this section were greased in an effort to cause them to act as dowels over their entire length. Subsequent comparisons of this section with other sections which contain ¾" square deformed longitudinal bars, should determine whether or not the bonding of steel to concrete for the transference of tensile stresses is of as much importance as the dowelling action, in the absence of a bond between the two. This section should also prove or disprove the advisability of providing against corner breaking by placing bars at 45-degree angles.

membrane under the pavement. The first application was of oil with a 40 to 50 per cent asphaltic content, one quart to the square yard of subgrade; the second application was 80 to 90 per cent asphalt, in the same amount per yard. This oil treatment was also considered a protection against the shrinking and expansion of the subgrade; and, for this reason, a sand cushion between the subgrade and the pavement, which would otherwise have been placed on the northern half of this section, was eliminated. The soil was of an adobe nature having a linear shrinkage of from 5 to 8 per cent.

Station 199+00 to Station 210+00 was the first section constructed in which slab steel reinforcing was used. While building this unit the contractor was permitted to do some experimenting in the placing of the steel. For this reason the reinforcement on this section is more likely to be defectively placed than that used elsewhere on the project.

Except as above outlined, no other deviations were made in the original plans, nor do any further conditions come to mind which would seriously affect any conclusion which may be drawn from subsequent studies and comparisons of the various types of pavement design. As time goes on, it is hoped that


DETAIL OF LONGITUDINAL WEAKENED PLANE
HALF PLAN FOR MESH REINFORCEMENT
HALF PLAN FOR BAR REINFORCEMENT
DETAIL OF TRANSVERSE EXPANSION JOINT
Portland Cement Concrete Pavement
Long. Joint
Profile Grade
Flat Section for rough Grading
2'-0"x4" Rock Border
TYPICAL SECTION-B
TYPICAL SECTION-A
TYPICAL CROSS SECTIONS
SCALE: ½ INCH=1 FOOT.
Superelevation to be used as directed by the Engineer
DETAIL OF EDGE REINFORCEMENT
DETAIL OF TRANSVERSE WEAKENED PLANE

From Station 37+50 to Station 39+50 poor local drainage conditions decreased the bearing power of the subgrade. To overcome this condition an additional inch in the thickness of the concrete slab and additional steel were authorized. This consisted of deformed longitudinal bars ¾" square placed at the edge and center in the southwesterly half of the pavement and also standard reinforcement of ⅜" bars placed on both sides two inches from the top of the slab.

On the three northerly sections containing slab reinforcement, Station 42+00 to Station 54+00, Station 66+00 to Station 78+00, and Station 90+00 to Station 102+00, the steel was placed two inches from the top instead of three inches as originally designed. This change was authorized because it was thought that, by being placed nearer the top, the reinforcement might be more effective in taking up tensile temperature stresses and the flexural stresses of heavy concentrated traffic loads. After the highway has been in use, comparison of these sections with the three where the steel is in the center of the slab should be of interest.

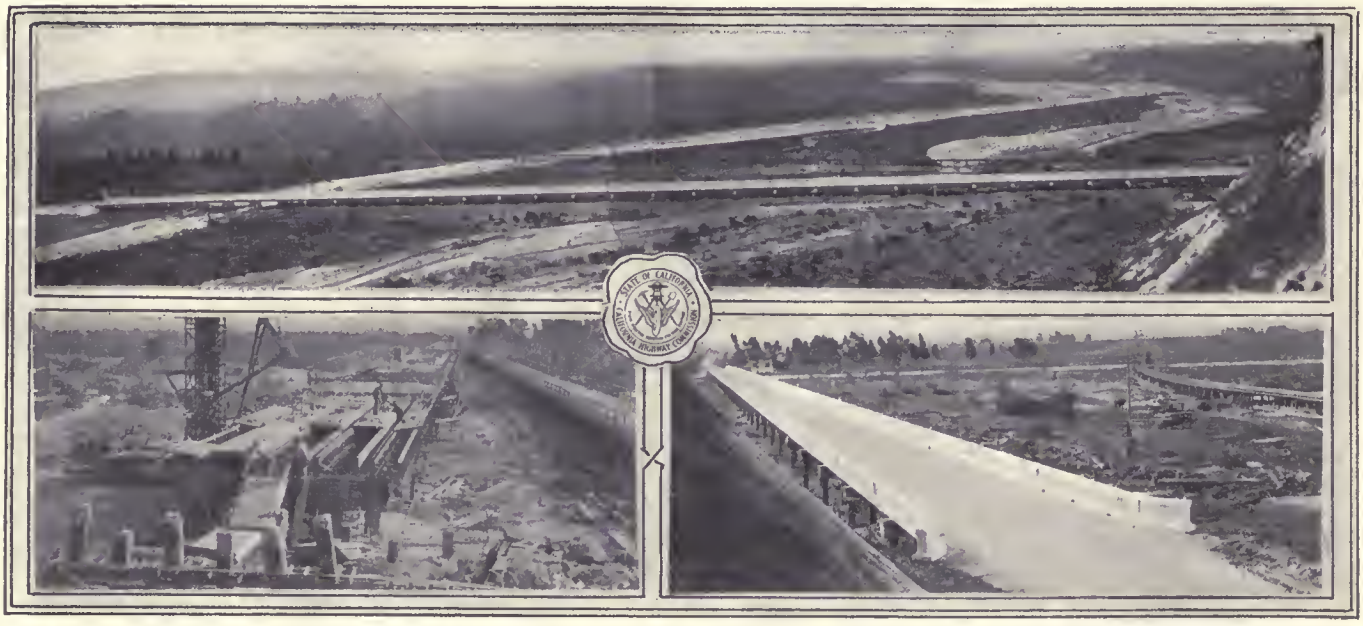
Because of high alkali content in the soil from Station 226+00 to Station 256+00, the completed subgrade was given two applications of asphaltic road oil to secure an insulating

these experiments may settle some of the moot questions regarding pavement design, steel reinforcement, and transverse joint spacing, which have not been as yet satisfactorily or conclusively answered.

Inspection parties who may go over this contract should have no trouble in picking up stations or in identifying the various sections, even without a copy of the layout plans. A different transverse joint spacing often marks a point of change in design. The contractor's stamp, placed at the beginning and the end of each day's run, also carries the station and the date. At points of change of design, the station number has been branded on either side of the expansion joint near the edge of the pavement.

There were also many visitors beside the state engineers; representatives of the steel companies and of the cement associations, city and county engineers, were frequent observers and valuable suggestions were received from these sources. A. D. Griffin, as resident engineer, was in general charge for Division VII. The inspection work was done by the following assistant resident engineers: W. I. Templeton, T. A. Rosebury, E. W. Taylor, O. W. Monroe, B. T. Thomas and J. P. McAndrew.

Santa Maria Trestle Interesting Bridge Project



NEW SANTA MARIA BRIDGE—Views of new structure, 1368 feet in length, across mouth of Santa Maria River on Coast highway, San Luis Obispo County. View at lower left gives comparison with former wooden trestle at this location.

A FURTHER improvement of the heavily traveled Coast highway is marked by the completion by the California Highway Commission of a reinforced pile trestle bridge (V-S.L.O.-2-F), two miles north of Santa Maria. Because of the length of the structure, 1368 feet, and other unusual conditions, the building of the bridge proved one of the most interesting problems coming under the supervision of the Bridge Department in recent months.

The new concrete structure replaces a wooden pile trestle built in 1913 by San Luis Obispo County. Heavy increases in weight and volume of traffic during its fourteen years of service caused rapid deterioration of the old trestle. Conditions also were unfavorable and in recent years the early structure became dangerous and obsolete. The new bridge is made up of thirty-six 38-foot, 4-girder reinforced concrete spans, with a 24-foot roadway, on reinforced concrete pile bents, with six piles per bent.

Various conditions introduced several interesting features in the construction. It was necessary for the department and the contractor to take into consideration flood conditions, the heavy traffic to be cared for, and the length of the structure to be built.

Flood Conditions Often Serious.

Santa Maria River, with the Cuyama, the Sisquoc and other minor tributaries, drains a mountainous, unforested catchment area of approximately 2500 square miles. The flow varies from no water at all in dry seasons to 100,000 second-feet after heavy storms, when rises are rapid and destruction often is serious in the sandy lowlands in which the bridge is situated. The present ¼-mile channel is in a new and apparently permanent course of the stream. The old channel, now flooded only at extreme overflow, is about 2000 feet south.

When a location was determined upon for the new trestle, the sites of the southern ends of the old and new bridges coincided, but the center lines diverged toward the north. Accordingly, to facilitate handling of traffic while construction was under way, a schedule of operations was prescribed in the contract.

The southerly 500 feet of old trestle, encroaching upon the site for the new bridge, was first removed and replaced by a plank road in a new location, which was connected to the northerly portion of the trestle by a ramp. The southerly 500 feet of new bridge was then constructed. Following the November rains, the river washed out the plank road and a short section of bridging was angled across so that traffic could use the completed portion of the new structure.

Contractor's Plant Layout.

The length of the trestle also presented a problem in plant layout which was met by the contractor in ingenious manner, as shown by the accompanying diagram.

A spur was run from the Pacific Coast Railroad to the center of the river bed, which brought the concrete and other materials direct to the storage and mixing plant. Tall aggregate bunkers were filled from the cars by endless chain bucket conveyors. Aggregates were discharged from the bunkers by chutes directly into measuring buggies located on a high mixing platform. The cement, brought in on flat cars, was stored in an elevated shed along side the track by means of a small car operated by cable and hoist engine.

A 2-bag, open-tilting Jaeger mixer discharged batches into a reservoir hopper supplying a ½-yard dump car operating on narrow-gauge tracks. The "locomotive" was a "home-made" contrivance resembling a railway "scooter.' An inventive combination of Ford transmission for forward speeds, and a Chevrolet transmission for backward speeds, gave efficient and flexible operation.

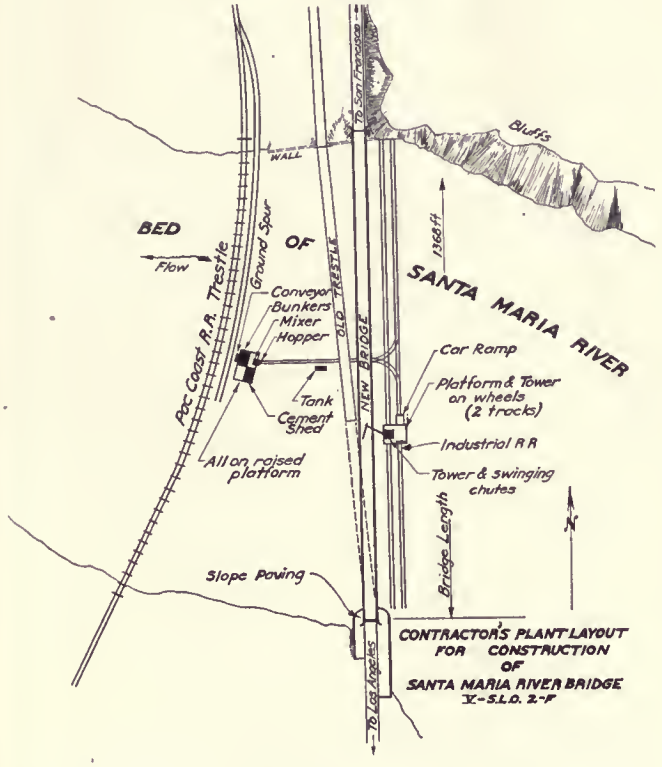
The narrow-gauge delivery ran to the center of the bridge, split, and paralleled the line of the structure on the upstream side. (See diagram.)

On the upstream side of the bridge a movable hoisting and chuting tower was built on a platform, which in turn was mounted on wheels and two separate tracks, one of which was the delivery line track. An inclined ramp track allowed the locomotive to push the car of concrete mix up to the hoist platform, where the contents were dumped sideways into a vertical skip in the tower. A gasoline engine, with cable

and drum, raised the skip which automatically dumped into a reservoir hopper above the chute. The flow from the reservoir was governed with a line-operated trip by the hoist engineer. A swinging boom allowed great flexibility in the operation of the two-piece chute which deposited the concrete at the spot desired.

Test Piles Are Placed.

The concrete piles were surface-treated to counteract the effect of alkali. All piles, except certain test and experimental piles, were given several coats of water gas tar paint, brush-applied. One coat was applied for full length before



driving, and, later, four additional coats were applied on all surface above the ground line and for two feet below the surface.

The test piles, for depth, were of lumnite cement concrete. Certain other piles designated for future investigation by the Testing and Research Laboratory were cast with (1) Class "A" (six-sack per yard concrete) (2) with "Laykold" Class "E" asphalt admixture, and (3), with "Biber" admixture. The remainder of the piles were cast with Class "F" (7 sacks per yard) concrete.

The contract also included grading and paving of the two approaches and constructing a concrete slope paving system on the south fill.

The cost of the Santa Maria trestle was approximately $120,000. The contractors were Rocca and Caletti of San Rafael. Resident engineers for the Bridge Department were J. C. Wilson and H. E. Fearnall.

A pedestrian has rights—yes. But too often they are the last sad rites.

—Tampa Tribune.

The Kaiser Paving Company of Oakland, a well known contracting firm that has built many miles of California state highway, has been awarded a contract for the constructing of some 120 miles of the new national highway of Cuba. The amount of the contract aggregates $20,000,000, the work to cover a period of five years.

INCREASE IN SMOOTHNESS

(Continued from page 6.)

Cement control on 1926 projects ranged from 2.64 per cent to nine-tenths of 1 per cent and averaged 1.49 per cent for all jobs; the general average for 1925 was 1.73 per cent. This indicates that, during 1926, the field men made good progress in maintaining the proper cement yield.

Concrete pavement yardage increased in daily average production from 179 cubic yards in 1925 to 186 cubic yards in 1926.

ASPHALTIC CONCRETE. Surface roughness on asphaltic concrete pavements for 1926 averaged 24.1 inches per mile as compared with 33.2 inches in 1925, or a decrease of 27 per cent.

Daily tonnages produced in 1926 varied from 69 tons to 388 tons and averaged 270 tons for all jobs. As the average for 1925 was but 214.4 tons, there was an increase in production during 1926 of 26 per cent.

SURFACE ROUGHNESS, ALL TYPES. Since the vialog was first brought into use for comparison of surface roughness, the yearly averages denote a steady improvement in the riding qualities of all types of completed pavements. The average for 1924 was 22.2 inches of roughness per mile; for 1925, 18.8 inches; and for 1926, 15.0 inches, a decrease of 20 per cent over the 1925 record.

California state highway pavements are becoming constantly smoother and therefore better. Elimination of the impact which results from vehicles passing over unnecessary roughness in the pavement surface means greater wearing qualities and a longer life for the highway surface. Much of the benefit which comes from added initial strength of pavements is lost without smoothness of surface.

MOUNTAIN SPRINGS GRADE

(From the Imperial Valley Press.)

THE control system is in force at present on Mountain Springs grade, between this city and Jacumba, causing motorists something of a delay while they wait for their turn to proceed in the direction in which traffic is allowed to move.

Caught in the jam Sunday, awaiting the signal to proceed, we were led to wonder if those who are thus held up, do any grumbling about the delay. Before the husky individual in charge of the control gave the signal to proceed, we, like most mortals, fumed at the delay. When the signal came, and we were soon on a stretch of pavement, on Mountain Springs grade, we felt ashamed.

Any valley resident who has been held in the control, will know why we were ashamed. To roll along smoothly even for a short distance, over what used to be dubbed "the worst road in southern California," is a real delight, worth waiting much longer than the control requires.

It gives one an idea of what pleasure it is going to be to go up or down the grade this summer, with pavement from Shepherd's bridge to the top.

Instead of fuming at the slight delay the control causes, we should be singing songs of praise, for the California Highway Commission, the engineers in charge of the work, and the laboring man who is making convenience and comfort for us.

The stretch of pavement now open is wonderfully banked, well constructed, and as smooth as a ball room floor. We can all well afford to be patient at present delays, and think only of the real enjoyment that travel westward from the valley is going to be in a few short weeks.

Five years ago a genuine mountain trail and in a short time it will be a boulevard! Its opening should give the valley a good excuse for a big celebration.

GOOD ROADS ITEMS.

"Wagner-St. Lukes—Owing to the condition of the roads in this locality, our regular weekly worship of Almighty God has been discontinued."

—South Dakota Churchman.

WHAT THE DIVISIONS ARE DOING

DIVISION I.

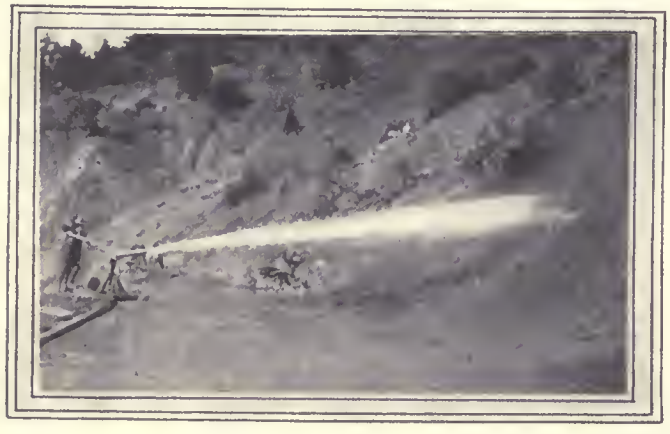
HEADQUARTERS, WILLITS.

T. A. BEDFORD, DIVISION ENGINEER.

Counties of Del Norte, Humboldt, Mendocino, and Lake.

DIVISION I, during the past month, has directed practically the entire time of its employees to removal of slides and repair of the highway, due to continued rains throughout the northwest counties. Many large slides, some new, others a continuation of former conditions, have damaged the Redwood highway to the extent of thousands of dollars. The temporary bridge at the convict camp on Smith River was washed away and considerable damage was done to other county-built timber structures at many places.

On March 18th, the rainfall at the convict camp had reached a total of 77.5 inches for the season and this record was



Slide removal by hydraulicking on Redwood highway near Garberville, Humholdt County. This method has proved most economical in many locations.

reported below that of the government station a little farther down the river. The road, however, is now open to travel and in fairly good condition.

Division I now has two ¾-yard, three ½-yard and five ⅜-yard power shovels operating on slide removal. Additional power shovels are expected to be put to work shortly in Smith River canyon, just south of the Oregon line.

Slide removal expense of Division I during January and February averaged $1,100 per day; during March it is expected to reach an average cost of $1,500 per day.

DIVISION VI.

HEADQUARTERS, FRESNO.

E. E. WALLACE, ACTING DIVISION ENGINEER.

Counties of Fresno, Madera, Merced, Mariposa, Kings, Tulare, and Kern, north of the Tehachapi.

DIVISION VI came through the recent heavy storms without serious damage to any highway. There were several rock slides on the Kern Canyon road, some very heavy boulders coming down, but there was only one complete washout on this section.

Route 10, west of Coalinga, suffered heavy slides and some erosion of newly made fills. Due to the numerous places where road is in the creek bottom, this route was impassable during the high water, but there was no major damage.

Travel over the Yosemite all-year highway was not interrupted at any time in spite of the heavy traffic (1600 cars daily) over this route, a portion of which is inadequately surfaced.

Considerable favorable comment has followed the shoulder widening and drainage improvement program for the trunk line which has been started between Tulare and Kingsburg, in Tulare County. For the first time since its construction, the Valley route between these points is this winter free from standing water. The roadbed has been graded and crowned to the fence lines.

DIVISION IX.

HEADQUARTERS, BISHOP.

F. G. SOMNER, DIVISION ENGINEER.

Counties of Inyo, Mono, and eastern Kern County, north of Mojave.

MAINTENANCE forces of Division IX have been busy making repairs of storm-damage, consisting of numerous washouts extending from Mojave to Lone Pine. Save for the occasional stalling of trucks and automobiles, traffic has been uninterrupted.

Motion picture companies have been fighting their way into the Mammoth Lakes country in Mono County, forty-five miles north of Bishop, to secure snow scene pictures. This has necessitated breaking a road through the snow at considerable expense. State maintenance forces have followed up their efforts in opening the road to travel.

Notwithstanding the heavy snow fall in Mono County, the division plans, with the facilities at hand, to open the highway for travel by May 1st, the date of the beginning of tourist travel. Sanding of the snow on Deadman grade to hasten melting is now in progress by state forces traveling on skiis on either side of the summit.

Improvements at Georges creek between Lone Pine and Manzanar have been completed, which include the relocation and surfacing with crushed rock of four miles of highway. Elimination of right angle turns and replacement of a timber structure with its dangerous approaches, at a crossing of the Aqueduct, with a steel bridge on new alignment built by the city of Los Angeles, is welcomed by the traveling public.

Surveys are now in progress for a relocation of the highway from Little Lake to Lone Pine, a distance of fifty miles.

Resurfacing with decomposed granite together with alignment changes, preparatory to oiling, is in progress between Fish Springs and Big Pine and south of Lone Pine.

Crews of Division IX breaking trail through snow between Sherman Hill and Mammoth Lakes, Inyo County.

HATS OFF TO R. L. THOMAS.

(From the Laguna Life.)

A rising vote of thanks should be given to R. L. Thomas, resident engineer for the State Highway Board, by the people of Laguna Beach. He has gone out of his way to serve the community, and his ability to meet an emergency has saved many an awkward situation. Mr. Thomas has used his authority intelligently, recognizing the fact that speed in the highway paving work will mean dollars in the pockets of Laguna Beach merchants next summer, and realizing that one delay gives an excuse for another.

DIVISION X.

HEADQUARTERS, SACRAMENTO.

R. E. PIERCE, ACTING DIVISION ENGINEER.

Counties of Amador, Calaveras, Alpine, Tuolumne, Stanislaus, San Joaquin, Solano, and southern Sacramento and Yolo counties.

DIVISION X has completed the building of a section of temporary pile trestle approach to the Rio Vista bridge across the Sacramento River on Route 53. This was necessary to care for traffic following a washout of several spans of the old structure during the recent high water. A change in the current of the river, due to dredging at the lower end of Wood Island, caused a scouring out of the bed of the river until the piling under a section of the bridge, a county-built structure, was entirely free.

A permanent bridge at this point has become necessary because of the plans of the federal government to remove all of Wood Island. The present temporary bridge will serve until the permanent structure is completed.

The temporary trestle was economically built by removal of the deck of the old structure in sections to a position on the new piling. This was accomplished by use of a large crane mounted on a scow.

While traffic was held up the division operated a power boat with a twenty-five passenger capacity to carry persons across the river.

Big Trees Road Taken Over.

A 16-mile section of highway leading to the Calaveras Big Trees, on a route made a part of the state highway system by legislative act in 1925, was taken over by Division X on February 16th and will, hereafter, be under state control and maintenance. The construction of this section was under the direction of the Bureau of Public Roads. It was a forest highway project with the federal government and Calaveras County cooperating in the financing.

The new section is well surfaced with crushed rock and in excellent condition. Many motorists have taken this route in traveling to the snow line during recent months.

BRIDGE DEPARTMENT NEWS

J. M. CURRAN, who has been assistant resident engineer on the Harlan D. Miller bridge in Shasta County, has been transferred to work on the Del Mar Crossing and San Dieguito bridge in San Diego County. M. E. Whitney will be in charge of this latter work as resident engineer.

W. A. Douglass, who has just completed the work on the San Felipe Wash bridge, will be assigned as resident engineer on the construction of the new crossing of the Santa Ana Bridge Overflow Channel.

A. L. Richardson, having completed his work at the Santa Ana River bridge, will take up the duties of resident engineer on the bridge across Sonoma Creek on the Black Point Cut Off.

John H. Peterson, assistant to resident engineer Thompson on the South San Francisco underpass, has resigned to accept a position with Barrett and Hilp, contractors of San Francisco.

H. R. Lendecke has been assigned as resident engineer on the construction of the Kern River bridge sidewalk near Bakersfield.

EMPLOYEE KILLED IN SLIDE.

WHILE at work during the night of February 17th, C. A. Turner, an employee of Division I, was killed in a slide, which was being sluced under the highway at a point about five miles south of Scotia, Humboldt County. In some manner he was caught in the debris and carried for a distance of 100 feet, and buried beneath mud and rock. It was impossible to recover the body until the following day.

As all telephone and telegraph lines on the Redwood highway were down due to storms, news of the accident was sent out by St. Clair Adams by wireless and picked up in San Francisco and telegraphed to the division office at Willits. The cooperation of Mr. Adams is appreciated by the division.

The next annual convention, American Association of Engineers will be held at Tulsa, Oklahoma, June 6-8, 1927.

FIGHT OF MAINTENANCE MEN ON PUNCTURE VINE EFFECTIVE

EFFORTS of maintenance crews of the California Highway Commission to stop the spread of puncture vine along the highways are proving effective. This is evidenced by tests made during the past year by W. C. Jacobson, chief of the Bureau of Pest Control of the State Department of Agriculture.

Samples of burs that had been sprayed with oil were gathered from the highway right of way in the vicinity of Vacaville, Solano County, and sent to Sacramento for testing. No germination was apparent after a test lasting 206 days.

Superintendent Commended.

Commenting on this fact, F. B. McKevitt, Jr., well known fruit grower of the Vacaville district, wrote as follows to District Maintenance Superintendent C. L. Caine of Division X:

> I am enclosing, herewith, two copies of the germination test which were made by the State Insectary in Sacramento. You will note that there were absolutely no germination at the end of 206 days. This shows that your method of treating the puncture vine brought results.
>
> I want to congratulate you on your very efficient handling of the puncture vine proposition here. If all the work was handled in the same efficient manner, there would be a great decrease of the amount of the puncture vine along the highways.

A GOOD WORD FOR DIVISION I

THE following letter with reference to conditions on the Redwood highway has been received by the state highengineer from L. L. Norris, of San Francisco, director of the touring department of the National Automobile Club:

> We recently received a detailed report on the condition of the Redwood highway from Mr. P. B. Carrington, our Eureka District Manager, and we believe that the following excerpt from his letter will be of interest to you.
>
> "The maintenance crews on this northern division are worthy of commendation; they are capable, and have fought the battle night and day regardless of conditions and weather. Those who have not traveled this road under hard storm conditions can hardly realize the difficulties which exist. The highway has been open and in far better shape through the past storms than has the railroad."

HIGHWAY NEWS NOTES

M. MALCOLM BERANGER, administrative director of the Societe La Bitume Liquide, of Paris, France, was a recent visitor at the Sacramento headquarters of the California Highway Commission. He was particularly interested in the work of Research Engineer C. L. McKesson. M. Beranger is in the United States as a representative of a corporation which is producing a new form of emulsified asphalt.

J. B. Woodson, former division engineer at Fresno and now of Los Angeles, has been appointed a member of the board of consulting engineers of the Los Angeles City and County Major Highways Committee and Traffic Commission.

Shop 5 reports the marriage of Miss Dorothy L. Kinsman, bookkeeping machine operator at the shop, to Mr. A. A. Gill of San Luis Obispo.

R. A. Reber, formerly with the Division of Water Rights, is now a member of the drafting force of Division X.

F. C. Hewett of Division X, who recently injured his knee while on reconnaissance work in Tuolumne County, is about to be released from the hospital. An operation on the injured limb was necessary.

STATE HIGHWAY FUND CONTRACTS (Bond Funds, Including Federal Aid)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE FEB. 23, 1927—None.						
					AWARDED SINCE FEB. 23, 1927—None.						

NOTE.—Primary construction covered by the above contracts does not include funds obligated on cooperative forest highway projects, prison camp road activities, or day labor jobs not being done under contract.

STATE HIGHWAY MAINTENANCE FUND CONTRACTS (Including Gasoline Tax Fund)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE FEB. 23, 1927—None.						
					AWARDED SINCE FEB. 23, 1927.						
M-160	VI	Kern	4	D	Kern River Bridge at Bakersfield		Sidewalk on existing structure	Peterson and Eissler	$8,413 31	Mar. 9, 1927	150
M-161	VI	Merced	4	A	Athlone to southerly boundary	4.51	P.C.C. Pave. Wid. and A.C. Surfacing	Allied Contractors, Inc.	105,706 13	Mar. 9, 1927	100
M-162	IV	Sonoma	8	A, B	Sooooma Creek Bridge			Proctor and Cleghorn	26,119 69	Mar. 9, 1927	150
M-163	VII	San Diego	12	A, B	La Mesa to El Cajon	3.69	P.C.C. Pavement	George Herz and Co.	154,223 57	Mar. 9, 1927	125
M-164	II	Siskiyou	3	A, B	Dunsmuir to Shasta River		Clearing right of way	J. P. Brennan	5,077 69	Mar. 9, 1927	75
						8.20			$299,540 39		
					PENDING AWARD—None.						

NOTE.—The above obligations charged against the State Highway Maintenance Funds do not include funds from these sources obligated for general maintenance and for specific betterments being done under day labor authorization.

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CALIFORNIA HIGHWAYS

A BULLETIN ISSUED BY THE CALIFORNIA HIGHWAY COMMISSION FOR THE INFORMATION OF ITS EMPLOYEES AND THE PUBLIC

Vol. 4 APRIL, 1927 No. 4

SAFETY IN MODERN HIGHWAY BUILDING—The above airplane view is illustrative of the safety features the California State Highway Commission is endeavoring to incorporate into future construction. The view shows the proposed rerouting of the state highway near Herndon, Fresno County, the proposed new bridge and the present routing of the highway. The heavy dark line marks the present route, the new routing being indicated by the white line. This eliminates Death Curve and others, two railroad crossings and the ancient Herndon Bridge.

AY 13 1927

CALIFORNIA HIGHWAYS

This Bulletin is published by the California Highway Commission for the information of its employees and the public. Editors of newspapers and others interested are welcome to use, without restriction, any of the matter herein contained. Cuts will be gladly loaned upon request.

J. P. HALL - - - - Editor
P. O. Box 1103, Sacramento, California.

Vol. 4. APRIL, 1927. No. 4

CALIFORNIA HIGHWAY DEPARTMENT

C. C. YOUNG, Governor.

CALIFORNIA HIGHWAY COMMISSION
RALPH W. BULL, Chairman, Eureka
J. P. BAUMGARTNER, Commissioner, Santa Ana
M. B. HARRIS, Commissioner, Fresno

R. M. MORTON, State Highway Engineer, Sacramento

HARRY A. ENCELL, Attorney, San Francisco
E. FORREST MITCHELL, Secretary

HEADQUARTERS STAFF, SACRAMENTO
T. E. STANTON, Assistant State Highway Engineer
L. V. CAMPBELL, Office Engineer

FRED J. GRUMM, Engineer of Surveys and Plans
C. S. POPE, Construction Engineer
T. H. DENNIS, Acting Maintenance Engineer
Bridge Engineer
R. H. STALNAKER, Equipment Engineer
C. L. McKESSON, Materials and Research Engineer

WILLIAM SCHLEIP, Principal Accountant
BEN H. MILLIKEN, Superintendent of Prison Road Camps

DIVISION ENGINEERS
T. A. BEDFORD, Division I, Willits
H. S. COMLY, Division II, Redding
F. W. HASELWOOD, Division III, Sacramento
J. H. SKEGGS, Division IV, San Francisco
L. H. GIBSON, Division V, San Luis Obispo
E. E. WALLACE (Acting), Division VI, Fresno
S. V. CORTELYOU, Division VII, Los Angeles
E. Q. SULLIVAN, Division VIII, San Bernardino
F. G. SOMNER, Division IX, Bishop
R. E. PIERCE (Acting), Division X, Sacramento

General Headquarters, Third Floor, Strub Bldg., Eleventh and P Streets, Sacramento, California.

EVERY employee of the highway commission has a direct interest in the improvement of the highway organization's methods and results, both engineering and clerical, office and field. To that end, the State Highway Engineer invites constructive criticism or suggestions from every employee.

Ideas as to the more economical and efficient handling of your job, or suggestions for elimination of waste will be welcomed. Criticism is also desired from persons outside the organization, who are in a position to give facts.

Send only signed communications addressed as follows: California Highways, P. O. Box 1103, Sacramento, Cal.

"CALIFORNIA HIGHWAYS"

OVER four thousand copies of California Highways are issued each month for distribution among the different State Highway Commission departments, including engineering, construction, survey and plans, maintenance, equipment, research, bridge and accounting, to municipal and county officials, including all supervisors, all newspapers throughout the state, highway contractors and road builders, highway associations and their officials, road and highway journals, many of which request reprints of its engineering articles, and to all persons, public officials and agencies who may request to be put on the mailing list. The Bulletin also goes to fourteen different foreign countries.

The highways of California draw practically all of her people into close touch with the state department as all use the highways, there being more than an average of one motor vehicle to every family. It is the duty of this organ to publish the results of the work of the state's great highway building department for the benefit of all who use the highways and to broadcast it to road building agencies of other states that they may profit by California's work.

NORTH LIKES GOVERNOR YOUNG'S HIGHWAY ATTITUDE.

THE announcement made by Governor Young before the annual convention of the county supervisors of the state in Sacramento, regarding his position on the highway question, should make him friends among all right-thinking people of the state.

Different localities too often become a trifle selfish in their desire for better conditions, and this is especially true when it comes to highway building. The governor, however, is right when he says that all state highways that connect with highways in neighboring states be completed first, and that all new highway programs which will call for laying out new highways must be held in abeyance until these connecting highways are completed.—Dunsmuir News.

COMMENDS COMMISSION FOR SAFETY PROGRAM.

THE people of Placer County will learn with pleasure that the California Highway Commission has decided to go ahead and eliminate the dangerous railroad crossings between Auburn and Colfax on the Victory highway.

The attitude of the present commission and the administration as a whole is favorable to the elimination of just such a menace as exists on this route. There are others in the state of a similar nature and they will receive the early consideration of the commission.—Auburn Journal.

COMMISSION SAVING TREES.

The Gerber Star reports that a crew of men under the direction of the California Highway Commission transplanted shade trees along the highway between Proberta and Red Bluff in preparation for the widening of the roadbed from 20 to 30 feet. The trees varied from 10 to 18 feet in height.

The California State Highway Commission realizes the value of shade trees along the highways.

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APRIL 1927

California Highways

VOL. 4 NO. 4

BUDGET FOR TWO YEARS' HIGHWAY WORK

ON April 14th Governor C. C. Young signed the general budget bill for all state revenues and expenditures for the two-year period beginning July 1, 1927, and ending June 30, 1929, the total amount being $193,770,465.09.

For the first time in the history of the state a detailed set-up of the revenues and expenditures of the California Highway Commission has been made a part of the budget data which was submitted for the consideration of the legislature. The setting forth of the detailed and explicit program to be carried during the biennium, including the listing of all work with its estimated cost, should have the effect of economical and efficient operation of the highway department.

Following are the figures regarding the highway work as taken from the budget:

REVENUES.

For Maintenance and Reconstruction.

Estimated Balance June 30, 1927	$15,600
Motor Vehicle Fees	8,009,400
Gasoline Tax (2 cents per gallon)	18,075,000
Transportation Tax	1,000,000
Total for Maintenance and Reconstruction	$27,100,000

For New Construction.

Federal Aid (Memorandum only)	$4,969,412
Special (State General Fund)	200,000
Grand Total	$32,269,412

EXPENDITURES.

Statutory Salaries (State Highway Engineer and Commissioners)	$41,600

Administrative.

Salaries and Wages	$1,026,840
Materials and Supplies	196,000
Service and Expense	343,800
Equipment	43,000
Total	$1,609,640
Maintenance	10,080,000
Reconstruction (99 jobs)	15,410,360
Total (Highway Maintenance)	$27,100,000

New Construction.

Federal Aid	$4,969,412
Special (State General Fund)	200,000
Grand Total	$32,269,412

Concerning the operation of the Highway Budget, State Highway Engineer R. M. Morton says:

"The subdivisions of the highway organization are expected to follow the set-up for the period included in the budget which was prepared by them last fall and approved by the central office. This means that the efforts of the divisions should be concentrated on preparation of plans and specifications for the reconstruction work detailed in the budget. Projects not mentioned in the budget can not take precedence over those which are set forth in detail. The amount set aside for maintenance of state highways must be carefully conserved and handled so as to accomplish that maintenance without exceeding the appropriations. The same applies to the minor improvements, and to all other details of the set-up.

Inasmuch as the budget includes a two-year period of activities, the divisions are requested to separate the proposed work into a schedule for each year, with approximately half of the total expenditure for each half of the biennium.

To a large extent the option to initiate new reconstruction projects or to delay those previously considered of immediate importance, has to be foregone under the budget. The energies of the department must now be concentrated upon accomplishing only those things which are included in the budget. Each division organization should familiarize itself with budget projects and appropriations which concern its territory, and should, as soon as possible, adjust its plans and its forces to accomplish the construction as outlined."

APPOINTMENT OF FRESNO MAN COMPLETES ORGANIZATION OF NEW HIGHWAY COMMISSION

The appointment by Governor C. C. Young of M. B. Harris, prominent attorney of Fresno and former member of the state senate, completes the organization of the new administration's State Highway Commission.

For several months Governor Young has been seeking a third member from Central California and the appointment of Senator Harris is the successful culmination of his efforts to secure an outstanding man from the San Joaquin Valley.

The California Highway Commission is now composed of Ralph W. Bull of Eureka, chairman; J. P. Baumgartner, Santa Ana; and M. B. Harris, Fresno.

CUBAN HIGHWAY TO COST SEVENTY-FIVE MILLION

A road-building project undertaken in Cuba, when costs are compared, makes Californians figure that we get our roads built at extremely reasonable figures. Contracts have been let for a paved road 705 miles long, from Pinar del Rio via Havana, Matanzas, Santa Clara and Campagney to Santiago. It is to be paved the entire length, to a width of 20 2/3 feet, with six-foot shoulders. The contracts call for completion of the project in five years. The total cost is $75,870,000, or an average of $107,465 per mile.

A 10-cent gasoline tax is one of the means used for financing the highway.

Czechoslovakia is planning to collect a tax on motor vehicles to meet the pressing need of highway construction. There are about 15,000 automobiles and 12,000 motorcycles in the country and the tax on them is expected to provide several million crowns per year.

HERNDON BRIDGE IN SERVICE SINCE 1903

Scene at Herndon Bridge 24 years ago when an 11-mile auto trip was a real adventure. Note the car lines of that period.

(Reported by E. E. Wallace, Acting Division Engineer of Division VI.)

TWENTY-FOUR years ago the Herndon Bridge, brand new, safe, and graceful, was adequate for any demands of the traffic of that day. This time honored span bridges the San Joaquin River about ten miles north of Fresno. Its ability to withstand the terrific pounding it has received in the last ten years has demonstrated that it was well built.

Today it carries all the north- and south-bound through travel of central California. It is crossed by tourists from every state in the Union. It ties together at the San Joaquin River the great highway that extends from Vancouver to San Diego.

Acting Division Engineer, E. E. Wallace of Division VI, reports the collapse of a trestle bent on this time-honored bridge, which occurred at two o'clock on the morning of March 9th, causing a sag of three feet in the floor. Following the accident several trucks and lighter vehicles passed over the damaged section. Nearby residents, by flagging traffic, undoubtedly prevented serious accidents.

Repairs were started on the day of the accident and by six p.m., a new bent had been erected and the bridge opened to traffic. By formal action the highway commission has limited the gross weight of vehicles to 8 tons, and signs have been posted.

Repairs have been carried on to keep the bridge temporarily in service. This work includes strengthening of all columns of the south approach. It is expected that the work of relocation, which will involve the construction of a new bridge approximately 950 feet long and 1.6 miles of new roadway, eliminating two existing grade crossings of the Southern Pacific, will be started later this year.

MINNESOTA FINDS GRAVEL UPKEEP COSTLY

Figures compiled by the Minnesota State Highway Commission show that the yearly cost of gravel roads on main routes is almost twice that of concrete roads. Depreciation, interest on investment, and the upkeep on the concrete trunk highway No. 3 cost Minnesota $1,678 per mile. The total cost per mile on trunk highway No. 1, a gravel road, was $3,101, a difference of $1,423 for each mile which properly could be listed as a loss.

NEW EDITOR FOR THE BULLETIN.

With this issue of "California Highways" the editorial duties are assumed by J. P. Hall, who succeeds Frank B. Durkee. Since January, 1924, the Bulletin has been edited by Mr. Durkee and under his direction has become a useful adjunct to the state's highway department. In 1926, Mr. Durkee passed the state bar examination. He is assuming new duties as right of way assistant to Harry A. Encell, attorney for the State Highway Commission.

Hall is a newspaper man of Colusa County, owning a weekly newspaper at Arbuckle, and recently was editor of the Daily Colusa Sun.

DIAGRAM OF EXPERIMENTAL CONSTRUCTION IN VENTURA

DIAGRAM SHOWING TYPICAL SECTION, REINFORCEMENT AND TYPE AND SPACING OF JOINTS TO BE EMPLOYED AT VARIOUS LOCATIONS.

The diagram reproduced on this page is for the information of those particularly interested in the experimental pavement sections recently completed on the Oxnard coast highway in Ventura County. This project and the building of these experimental sections was described in an article, which appeared in the March, 1927, issue of California Highways under the heading "Experimental Pavement Sections on Oxnard Route."

Use of this chart in connection with the article referred to will permit engineers and others to investigate the results of traffic on the various pavement sections. The experiments consisted chiefly in twenty-one pavement designs differing with respect to steel reinforcing and transverse joint spacing. Lack of space prevented the use of the diagram in the March issue.

By referring to this diagram and the article in the March issue, it will not be necessary for investigators to have with them the official construction records when inspecting the project.

Romance of Transportation in California

By F. W. Hazelwood, Division Engineer, Division III.

Editor's Note—A paper, prepared by F. W. Hazelwood, Division Engineer of Division III, and read before the Sacramento Chapter of the American Society of Civil Engineers, was sent to the editor's desk with the idea that it might contain something of interest regarding state highways that could be rewritten. Reading it over the editor was so entertained with the romance containing so much of interest regarding the early transportation problems of the California pioneers, which had a great bearing on later and modern road building, that he was convinced that to reduce or cut the story in any way would be out of the question.

The Bulletin has never run a continued article but will make an exception of Mr. Hazelwood's "Romance of Transportation in California," running it in two installments, the first of which appears below.

IN THESE days of specialization in engineering as well as in other professions, most of use are so wrapped up in the particular branch in which we are engaged, that we too rarely see beyond it. Like an amateur musician with an instrument of many strings but with ability to play on but one, there should be no apology needed if in attempting to take up a brief period of your time I adhere to the subject with which I am most familiar.

I am not, however, going to discuss any technical phase of highway engineering either in general or specifically, but rather to look back into the earlier history of the state and bring to you a few facts relative to the transportation emergencies in those days and to the development of roads in general and one road in particular.

The territory now under my jurisdiction includes two routes over the Sierra Nevada Mountains, one by way of Auburn and Truckee and one by way of Placerville and Lake Valley which are now as they were in the early days, rival roads.

Along the Placerville road are many markers which I call the "Here stood" signs, put up by the Native Sons to mark the spot of a stage station, hotel or saloon of the early days. It is reported that the Auburn road is soon to be similarily marked.

These signs suggest a stage in development of California and a problem in transportation so different from those we have on these same roads today that I have always had a desire to go back into the early history of the state and learn more of the transportation requirements of that great population that teemed the mining regions on both sides of the mountains and the means by which these requirements were met. We today look upon this early period as one brief and romantic, accomplishing its purpose and passing with the once populace mining towns; but the transportation system developed was a heritage of these times even though it flourished for a few years and was then pushed into the background, if not into complete decadence, by the completion of the Central Pacific Railroad.

In gathering data I soon found that the subject was a large one and I am therefore confining my attention to the development of that remarkable artery of commerce leading from Sacramento to Atchison by way of Placerville and particularly the portion leading from Placerville to Carson Valley, over which passed a traffic, the magnitude and details of which are almost inconceivable today.

Following the Mexican War, the movement of Americans to California which began about 1841, both by boat around the Horn and overland across the mountains and the desert, was greatly accelerated. The greater impetus to this migration came with the discovery of gold in 1848.

Transportation conditions were acute in those days. There were neither roads nor suitable vehicles. Commodities and equipment and many people came by boat to San Francisco. The only method of getting to the mining camps was by boat to the river ports at Stockton, Sacramento and Marysville and thence overland. Thousands of immigrants came westward overland establishing several well known emigrant routes over the mountains, one of which was by the way of Carson and Hope Valleys and Placerville, but freight could not be brought in by this method.

There was at this time neither on land or water any organized means of transportation. No such thing as a common carrier existed prior to the discovery of gold. A few row boats and small schooners operated between Yerba Buena and Sacramento. Every emergency, however, finds some one ready to meet it and in 1849 many sailing boats and steamers made their appearance on the rivers. One of the early steam boats on this run was the Senator, a steamer of 500 tons, brought around the Horn by James Cunningham, afterward father-in-law of D. O. Mills. As an indication of the demand for transportation it is interesting to note that during her first year on the river the Senator earned $60,000 per month. The fare to Sacramento was $30 with $10 extra for a state room and meals were $2 each. Freight was $40 to $50 per ton.

Competition in this lucrative business naturally and rapidly developed and early in 1850, 43 sailing vessels and 16 steamers were on the run from San Francisco to Sacramento while at one time 59 ocean-going sailing boats were lying in the river waiting to unload their cargoes.

A condition in river transportation familiar in the growth of an industry soon developed. The pendulum swung too far, competition became too keen. There were too many in the business and it was a case of everyone for himself. In 1852 the passenger fare reached a low figure of $2.

Out of this chaotic condition was born the California Steam Navigation Co., organized March 1, 1854, with a capital stock of $2,500,000, which retained control of water transportation in California for 17 years.

Previous to and during 1849 land transportation was conducted almost entirely by pack animals. The first known regular wagon transportation was in 1848–9 when a wagon operated once a month from the river landing at New Mecklenberg (Marysville) and Daniel Silles' ranch in the upper Sacramento Valley.

The great influx of people to the mining camps requiring transportation of food, clothing, supplies and equipment resulted in early exorbitant rates until these transportation agencies followed a similar course of over development and organization, as did river transportation.

A merchant in Coloma paid in ten consecutive days $65,000 in gold dust for the transportation of goods from Sacramento to Coloma. With this tariff it is no wonder that flour was $1 per pound and pork $1.50. The charge for packing from Coloma to various camps along the river was 50 cents to $1 per pound additional.

Development of roads became an immediate necessity and it is recorded that in the early fifties El Dorado County built and maintained a network of roads radiating from

(Continued on page 7.)

Roman Roads and the American Federal Aid System

IN the past quarter century there has been a greater revival of interest in highway construction than has occurred since the building of the Appian Way 2000 years ago. Rome is credited with the finest roads of history, some of which are still in existence.

Contemplating the past, it is interesting to contrast the methods and the motives of the Romans, in their highway activity, with the methods and motives back of the highway construction of today. Rome built roads to hold her empire together—by force.

She built roads in order that troops might be moved quickly to points where insurrection from within, or invasion from without, threatened the stability of the government and the prestige of the empire.

Americans in the building of the great federal aid system, which today covers the country, seek to cement together a nation and an empire—but not by the use of force.

Americans realize that widespread familiarity with the many sections of the country will result in understanding, appreciation, and the establishment of unity. It is to be hoped that troops will never move over the great highways, stretching from coast to coast, to subdue either internal uprisings or repel invasions. But the fellowship of the man in New York and the man in San Francisco will be strengthened and the nation as a whole knitted closer, when, from the Atlantic and the Pacific, "the twain have met" and have learned to know and understand each other. Without good roads, this will not be possible.

Americans, however, because of the difference in motives, are building a more unified and permanent empire by good roads than ever was accomplished by the Romans.

THE TYPE CONTRACTORS CRY FOR.

The foreman had come across Bill slacking and smoking on his job, and spoke his mind thus: "Look here, Bill. This 'er's a contract job, and it ought ter 'ave been finished by now. Jest shove that pipe away an' get on wiv yer work, else it will be the sack for you."

"Well," said Bill, deliberately, "yer know Rome wasn't built in a day."

"Don't want none o' yer back answers," said the foreman. He paused and then added: "'Sides, I wasn't the foreman on that job, neither."—Louisiana Highway Magazine.

Romance of Transportation in California

(Continued from page 6.)

Coloma to the principal bars along the river or important centers of population, chief among these being the road to Georgetown.

As an indication of the status of land transportation in 1853 it is interesting to note that there were engaged in packing from Marysville some 33 firms and 20 Mexican owners of mule teams. The number of mules packing from Marysville to the surrounding mines was over 4000 and over 400 wagons with 4- to 6-horse teams or oxen were employed.

There rapidly developed from the necessities of the case, stage companies handling passengers, express and mail and freight contractors to carry merchandise from river ports to interior towns. These contractors were equipped with great wagons carrying from 4 to 6 tons and hauled by from 4 to 8 spans of mules.

(To be concluded in May number.)

SMITH RIVER IN DEL NORTE GIVES TROUBLE SANS WARNING

RIVER ON RAMPAGE—*Above,* summer level of Smith River, Del Norte County; temporary bridge in use while Redwood highway is under construction; *below,* three views taken within an hour showing destruction of bridge during recent storm; heavy wire cable anchors were of no avail. (Views taken near prison road camp.)

Historic Priests Grade Now Modern State Highway

Reported by C. Bovey, Maintenance Engineer, Division X.

PRIESTS GRADE is a name familiar to practically all tourists and pleasure seekers who travel in the high Sierra Nevada Mountains. For many years, this grade has been considered a very dangerous one and has thus become famous. Many people have foregone the pleasure of going into the Yosemite Valley by way of the Big Oak Flat road because they feared this grade.

Widening operations have been under way for some time on this grade, and it might be of interest to the readers of the highway magazine to give some of the history of this famous grade.

Early in the 50's, miners rushed to Chinese Camp, Moccasin Creek, Big Oak Flat, and other historical mining sites in this vicinity. A saw mill was started in the mountains above Groveland to furnish lumber for the various mining activities and as there was a large camp on Moccasin Creek which is at the foot of Priests Hill, it became necessary to construct some kind of a road to haul lumber to this camp, and also to haul supplies from the valley to the various camps above Priests. So, in 1859, this road was started.

There had been a great gold stampede just prior to this time in other parts of the state, and as usual, after such a stampede, many of the miners returned to their former haunts dead broke. This was especially true of the miners who returned to Moccasin Creek and Big Oak Flat, and so labor was cheap at this time. Scores of the miners were glad to seek employment building the road between Moccasin Creek and Priests, at the rate of $1 and board per day. This road was constructed almost entirely with pick and shovel and wheelbarrow.

Tourists who have traveled up Priests Grade remember how steep and formidable it looked. This road was used for heavy hauling up until the year 1913. Old residents in the vicinity of Priests tell of seeing 30-horse teams negotiate this grade. The limit load for each horse in those days was considered a thousand pounds. When automobiles first tried to negotiate the roads in this vicinity, they found old Priests Grade a little bit too tough for them. Mr. Corcoran, proprietor of Priests Hotel, says that he kept a team of horses harnessed up in his barn at all times during these days to pull the automobiles up the grade. He had very little rest as practically every car that tried to negotiate the grade had to call on him for help. A few intrepid drivers found that they could back up the hill instead of going up the right way, as the old gravity feed systems on the cars would not permit the gasoline to flow into the carburetor on some of the steep grades unless they backed up the grade. Anyone taking a look at the old grade now would wonder who had the nerve to back his car up it.

In 1912, the residents in the vicinity of Big Oak Flat decided it was time to build a new road to take the place of this famous old grade. They figured if they could get any kind of a road blazed through that would permit a car to travel over it, they could ask the county to take over the road. An engineer who happened to be living at Priests at that time took over the job of surveying the new route and he made an excellent job of it, laying out a fairly well aligned road and a very uniform grade averaging less than 6 per cent, which was rather a light grade for those days.

Miners and citizens of Big Oak Flat and vicinity took up a public subscription to finance the building of this new highway, and succeeded in raising enough money to build a highway along the new grade, seven feet wide. Hardly had the new road reached the top when the leader behind the movement started out to negotiate the grade with his horse and cart. He took several men along with him to help boost him over some of the worst places, and as soon as he had negotiated the stretch, the citizens of Big Oak Flat asked the county to take over the road and widen it. Evidently, the county officials were behind the movement as they accepted the road almost immediately as a county road, and soon after widened it to make it fairly safe for a one-way road.

On May 19, 1915, by special legislative act, the Big Oak Flat road was taken over by the state to connect with the road inside the National Park line which was then known as the Great Sierra Wagon Road. The road at that time was approximately 12 feet wide.

At first the road was maintained by the State Department of Engineering and later was taken over for maintenance by the California Highway Commission. State maintenance forces kept working on Priests Grade, widening it in its most dangerous spots and improving it throughout.

Splendid work was done on this grade by Superintendent S. E. Harris, now of Jamestown, and later by Ben H. Milliken now State Superintendent of Prison Road Camps.

In 1924, under the direction of Superintendent W. H. Martin, the Priests Grade was widened from the top of Priests to the Moccasin Creek turnout to a width of 16 feet throughout, but from Moccasin Creek turnout to the foot of Priests Grade remained an average width of fourteen feet, although maintenance forces under the direction of Mr. Martin continued to widen it in places from year to year.

Late in the fall of 1926, work was started on a real widening program for Priests Grade. The Hetch Hetchy Water Service Department of the city of San Francisco had imported a large 1¼-yard Marion steam shovel to Moccasin Creek for the purpose of constructing a road near the power plant. They very kindly consented to cooperate in the widening at Priests Grade by furnishing this large shovel at a very nominal rate. Work was actually started about December first at the foot of Priests Grade and was carried through to the Moccasin Creek turnout by January 16, 1927.

At first, it was the intention of the highway commission to widen to the Moccasin Creek turnout only, but the results proved so popular with all the citizens in the vicinity and with the public at large that the commission decided to appropriate $15,000 more to carry the work on to the summit of Priests Grade. The large shovel has been tearing away at the grade for several months and on March 21st the last bucketful of earth was dumped over the grade at the top where the famous old Priests Hotel once stood, but which was destroyed by brush fire in 1926.

Superintendent H. L. Montfort has been in charge of the entire widening operation, and has performed splendid work throughout. The grade now has a minimum width of twenty feet, and in many places is much wider. The chief improvement has been caused by cutting down blind points and placing the earth on the sharp in-curves, thus straightening the road and making it more visible throughout.

Tourists should no longer have any fears in negotiating this famous old grade as there are now very few blind curves

(Continued on page 9.)

HEAVY SNOWS STILL BLOCK SIERRA HIGHWAY

SCENES ON THE CALIFORNIA STATE HIGHWAY IN THE HIGH SIERRAS—(1) Donner Lake from Donner Summit; note Donner Summit Bridge to the left. (2) A 20-foot cut on the highway nearly level with snow. (3) State highway looking towards Donner Summit. (4) Camp at Tahoe City. (5) State highway looking east towards Tahoe City from Tahoe Tavern.

The opening of the California State Highway over the Sierra Nevada summit will be delayed considerably this year judging from the report brought back by Division Engineer F. W. Haselwood of Division III and Maintenance Engineer J. C. Vickrey who made a trip into the snow on the week end of April 17th.

Going to Truckee by train they made an inspection to the west as far as the Summit, making their way on skis. In some places the snow was found to be from ten to fifteen feet deep, with a number of drifts of greater depths.

The highway commission will open the road to the head of Donner Lake and when opened sanding of the road west of that point will begin.

The accompanying pictures give an idea of the difficulties to be overcome before the Truckee route will be open.

P. L. Fite has been appointed to take the place of Harry L. Montfort, resigned, who has been maintenance superintendent on the Big Oak Flat road. Mr. Fite has taken over superintending the finishing touches on Priests Grade, on the Big Oak Flat route into Yosemite. He has seen a number of years service with the highway commission of South Carolina and has also supervised road work in Mexico. He is the son of Joseph S. Fite, chief filing clerk in the commission's Sacramento office. Mr. Montfort has entered the contracting business at Sonora and will be one of the owners of a rock crushing plant. He was one of the most popular engineers of the department and has the best wishes of many friends.

Historic Priests Grade Now Modern State Highway

(Continued from page 8.)

left on this stretch, and even these are plenty wide enough to negotiate without any feat.

Standard guard rail is soon to be placed at all points which might be considered dangerous. All work will be completed in plenty of time for the regular summer rush over the Big Oak Flat road to the Yosemite Valley.

Widening of Priests Grade should prove very popular and should make the Big Oak Flat road into the Yosemite Valley almost as well traveled as the new all-year highway, as it is far more scenic and gives one a real taste of the mountains.

HIGHWAY BASEBALL TEAM OPENS SEASON.

With "Bill" McNeely as captain and Marion McGriff, manager, the state highway ball team opened the season on April 16th, meeting the capitol building team. The capitols must have recruited among the legislators as our boys were left on the short end of a 10-2 score.

Manager McGriff reports the following as signed up with the highways: Garrigan, Faustman, Hawthorne, Zink, Simpson, Dwyer, Kimball, Lernhart, Peacock, Manhart, McGriff, Cook, Sullivan, Haley, McNeely, Temby, Kerins and Pieper.

Manager McGriff has entered his team in the Sacramento Twilight League and so will be well fortified with "previous engagements" in case challenges come in from division teams.

DISCUSS WIDER PAVEMENT POLICY

At the recent meeting of the Michigan State Administrative Board in the office of Governor Green in Lansing, State Treasurer Frank D. McKay suggested that the board establish a definite policy of wider trunk line pavements. Mr. McKay had been quoted as favoring a policy of a 24-foot width but did not adhere to this idea when it was explained by State Highway Commissioner Frank F. Rogers that a width of 24 feet would only invite increased congestion and added danger. Mr. Rogers explained that if a pavement is widened beyond 20 feet that nothing further under 30 feet would be advisable.

Mr. McKay said in this connection:

> "It seems to me that this board ought to establish some kind of policy, anticipating road traffic within the next few years, especially out of the city. The first five or six miles out of towns should be 35 or 40 feet and the rest 30 feet."

Commissioner Rogers replied: "A 24-foot road is a dangerous road. Some people think they are three-lane traffic roads, and they are not, with safety. In building roads 20 feet wide we seek to establish shoulders 8 or 10 feet in width so that in the future it might be possible to build 10 feet on each side of the road, when traffic demands. Of course, a 20-foot road, in my opinion, is just as safe as a road between 20 and 30 feet. Then there is no stopping point until you get to 40 feet. Our thought has been in building grades to build wide enough so that we can widen the road if necessary. Of course that would mean very hard work in rolling country."

Mr. McKay asked Mr. Rogers if he did not think that trunk lines out of a town of any size for five or six miles should be at least 30 feet wide. Mr. Rogers stated that that should be based upon the size of the town and the amount of the traffic.

"Of course," he said, "there are towns like Grand Rapids which have a heavy traffic, and I think that M-13 out of Grand Rapids should be 30 feet wide for a considerable distance. Out of Detroit we have them wider."

Mr. McKay asked Mr. Rogers if he did not think that bridges on trunk lines should be built so that they can be widened, and Mr. Rogers said:

"We are building all our bridges that way at the present time."—Michigan Roads And Pavements.

The California Highway Commission is now making no pavement less than 20 feet in width and in sections close to large centers widths of 30 and 40 feet are used. Whittier boulevard in Los Angeles County, with a width of 56 feet was built with county and special road fund cooperation, while Del Paso boulevard, in North Sacramento, recently completed, has a width of 76 feet. Property owners cooperated with the state in the building of this pavement.

THE BRIDGE BUILDER.

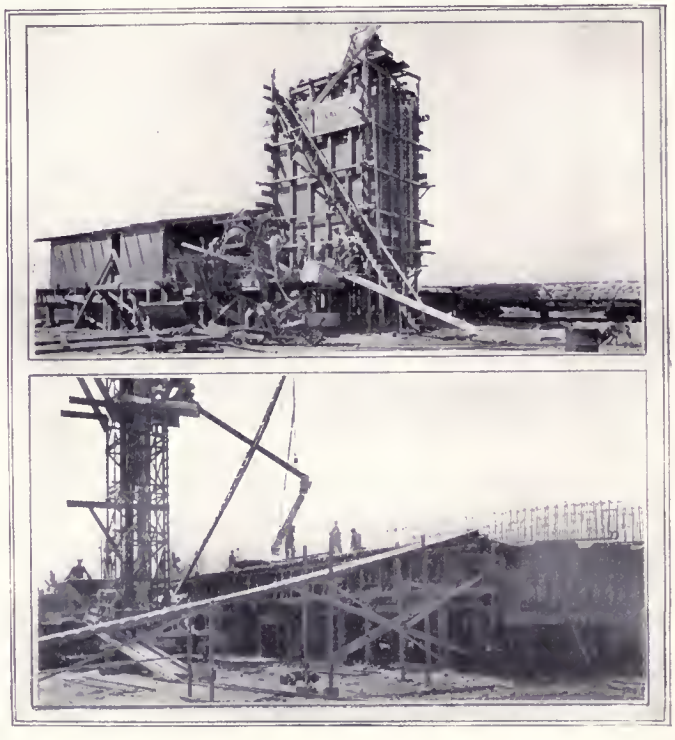
An old man, going a lone highway,
Came at the evening, cold and gray,
To a chasm vast and deep and wide.
The old man crossed in the twilight dim;
The sullen stream had no fear for him.
But he turned, when safe on the other side,
And built a bridge to span the tide.

"Old man," said a fellow pilgrim near,
"You are wasting your strength by building here;
Your journey will end with the ending day;
You never again will pass this way.
You've crossed the chasm deep and wide;
Why build you this bridge at evening tide?"

The builder lifted his old, gray head.
"Good friend, in the path I have come
There followeth after me today," he said,
"A youth, whose feet must pass this way.
This chasm, that has been naught to me,
To that fair-haired youth may a pitfall be;
He, too, must cross in the twilight dim.
Good friend, I am building this bridge for him."

—*Anonymous.*

Snow removal on Burney Mountain section of Alturas lateral. Photos by Division II.



PLANT LAYOUT—*Above*, central storage and mixing plant on Santa Maria bridge contract; bunkers were filled directly from cars by bucket conveyors; mixer discharged batches directly into reservoir hopper supplying dump car on narrow gauge track. *Below*, movable hoisting and chuting tower mounted on platform and operating over railroad track; note incline and dump car on hoist platform.

World Peace Through International Roads

IN EARLY times there was a saying that a "Roman peace" was a world-wide peace—and highways built by the Romans were a potent influence in maintaining peace.

In modern times we have the same opportunity to cement the friendships of nations through the influence of highways. The advent of the automobile and its transition from a luxury to an economic necessity has made the better roads movement an international matter.

The National Bank of Commerce in New York has made a study of the international demand for road improvement and some of the conclusions of the report furnish an interesting commentary on the progress of road building in foreign countries.

Trunk highway development was practically neglected during the last half of the nineteenth century when railroads were thought to have supplanted roads permanently.

Existing roads, except those built primarily for automobiles, were intended for horse-drawn vehicles and have deteriorated rapidly under the speed and weight of the automobile. In those countries possessing good systems, the problem has been to conserve the present highways, and make them equal to the demands of modern traffic. Newer and less developed regions, such as Australia and South America, must answer the demand for improved highway transportation by building new roads.

France, well known for its fine roads and a pioneer in their construction, drainage and maintenance, has excellent national highways and the road problem there is largely a matter of deciding upon the most suitable surfacing. English roads in general compare favorably with the French. Striking unanimity prevails in reports from all parts of the world of increased registration of motor vehicles, and interest in, and plans for road building. In Scandinavia roads are now deemed so essential to the country's development that it is realized that future appropriations must be greatly increased to keep up with the growing volume of motor traffic. Poland has recently adopted an ambitious road program and Finland expects soon to have 30,000 miles of improved highways.

Development of good roads in Egypt is making rapid progress. Farther south in Africa, in Nigeria, in Southern Rhodesia and in the Union of South Africa there is public interest in the road problem. Despite political upheavals China is showing a genuine enthusiasm for road building and a growing realization of the necessity of highway development. Australia is planning to spend over $16,000,000 on highway development this year and will devote $100,000,000 to be expended on roads in the next 10 years. New Zealand's highway development is going ahead rapidly.

However, it is in Latin America that the most striking movement is taking place. Transportation means of any kind are inadequate in Latin America. Railroads have been built at heavy cost of money and energy but expansion of the highway system will probably come more rapidly because the public is already converted to the use of motor service. Several Latin-American republics have ambitious programs, many of them being already well under way. Increasing ownership of automobiles, bringing the inevitable demand for good roads, has generally been responsible for the good roads movement in South American countries.

Highway expansion stands as the most significant transportation development since the advent of the railroads. Increasing motor-vehicle registration is the best indication of the wide sweep of this movement as a good-road program usually accompanies extended use of the automobile, although in turn, increased traffic follows improved highways. Among the incalculable economic benefits of good roads to a community are cheaper transportation costs, better standards of living, the opening up of potentially rich and unexploited districts formerly inaccessible, improvement of regions already served and a general increase of commercial activity.

American leadership in pavement surfaces has been one of the consequences of the tremendous development of the automobile industry in this country which has far outstripped similar development in other countries.

And so again highways have become agents for world peace and American engineers are doing their part to preserve the peace of the world through leadership in pavement design and construction.

NATIONAL AND STATE ROAD PROGRAMS IN BILLION CLASS

(From the Chico Record.)

OUR federal and state governments alone spent on important highways, in the last five years, more than a billion dollars, of which the federal government has paid almost half. The federal highway system is now three-fourths improved. Last year there were added to this cooperative system over 9,000 miles, making a total of 56,000 miles. More than 182,000 miles have been planned for interstate traffic.

Federal and state officials are now working on a plan that would provide within a few years ten well-paved transcontinental routes east and west, and the same number running north and south.

Congress has been asked to authorize negotiations looking to the creation of a great Pan-American highway connecting the capital of Canada and those of the United States, Mexico and all the countries of Central and South America.

This last venture may wait until certain current difficulties with Latin-America are ironed out. But obviously things are moving in regard to roads. This is the road-building age.

WEBB'S RULING AIDS HIGHWAY WORK.

Attorney General U. S. Webb on the 21st instant ruled that the California Highway Commission could now legally award contracts for work that are to be paid for out of the budget for the coming biennium which begins Just 1st. As many parts of the state are anxious to have their allotted work started Webb's ruling will be appreciated.

HIGHWAY COMMISSION COOPERATING WITH COUNTY OFFICIALS FOR THE ERADICATION OF PUNCTURE VINE.

The fruit men of northern Solano are loud in their praise of the manner in which the state and county officers have controlled and destroyed the puncture vine in Solano. C. L. Cain, a maintenance foreman for the Highway Commission worked in conjunction with Carl Spurlock, horticultural commissioner, and J. W. Mills of the farm bureau. The new method of killing the puncture vine was to oil the vine twice. The first oiling opening the burrs and the second killing the germ.—Vallejo News.

The French Parliament, in the 1927 budget, passed the largest government appropriation it has ever made for roads and bridges, 2,000,000,000 francs.

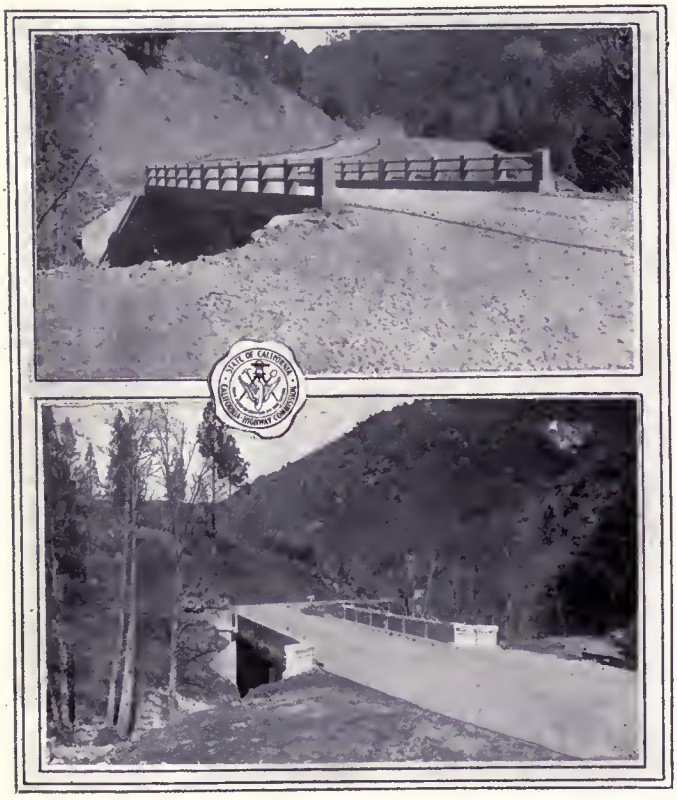
ALL-YEAR HIGHWAY TRUE TO NAME.

"The new all-year road certainly lives up to its name," W. B. Lewis, superintendent of Yosemite National Park, said following his return from a motor trip to Fresno.

Due to excellent maintenance work by the California State Highway Commission, Yosemite Valley has been readily accessible to automobile visitors since the new route opened last August.—Portland Oregonian.

Extraction of road taxes from the populace has been found less painful by the use of "gas" than by any method tried.—Kentucky Highways.

MODERN BRIDGE PRACTICE

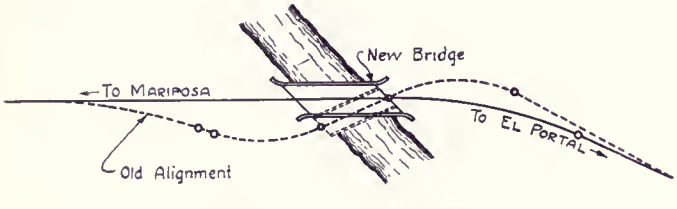


NEW BRIDGE PRACTICE—At Bear Creek on Yosemite highway. *Above*, old structure at right angle across stream; *below*, new bridge using old substructure with alignment greatly improved.

MODERN ideas practicable for present traffic are now going into the building of better bridges on California state highways.

Three outstanding developments in bridge design have been developed during the past two years. These are wider roadways, better alignment of bridge and approaches, and more attention to esthetics of design.

The standard width of roadway for state highway bridges previous to 1924 was, with few exceptions, twenty-one feet. Today, on roads where twenty-foot pavement is contemplated or seen as a future possibility, bridges are made twenty-four feet wide, or wider. Where traffic justifies wider roads, bridges are being built correspondingly wider. A number of thirty-foot bridges and subways have been built during the past two years, and some have been constructed as much as forty feet in width. Bottle-neck bridges that retard traffic are no longer tolerated on new construction and are being eliminated on the old roads as fast as funds permit.



NEW ALIGNMENT AT BEAR CREEK.
YOSEMITE LATERAL.
XI-MPA-18-E.

It was formerly the practice in highway bridge construction to build bridges at right angles to the stream wherever possible and without vertical or horizontal curves in the structures or approaches. Economy and simplicity of design resulted from this rule, but it also often resulted in dangerous sharp turns at bridge approaches and poor alignment generally.

It is now the aim to make the alignment and riding qualities of bridges and aproaches equal to the high standard used in building highway pavements, so that maximum speed limits may be permitted with safety. Studies are constantly being made of proposed crossings, and where necessary the bridge is skewed or curved to get the desired result in the most economical manner.

MAINTENANCE DEPARTMENT PREPARES MOTORING PUBLIC FOR HIGHWAY OILING PROGRAM

Between April and September of this year, the Highway Commission will expend $600,000 throughout the state in oil treating some 700 miles of crushed rock and gravel roads.

The effective life of the resulting surface is economically justified, not only by the immediate benefits of reduced maintenance and elimination of material loss, but also by the fact that traffic is served by dustless roads whose smoothness rivals that of more expensive construction types.

An important feature of oiling the highways is the care of traffic over roads being oiled, so important in fact that T. H. Dennis of the Maintenance Department has issued a letter of instructions to all division engineers in an effort to have the matter handled in a manner that will reduce to the minimum the inconvenience to the motoring public.

Following are the instructions as issued:

Our success in oiling and its continuation depend entirely on the way we handle traffic. If poorly handled, it may become so unpopular with the public that it will have to be abandoned. Therefore, let this part of the program reeeive your earnest consideration. The following suggestions are submitted as an aid in this work.

1. Where possible, use detours and see that they are adequately signed and the signs kept illuminated at night.

2. Keep the press and the auto clubs' representatives fully advised of these detours.

3. Where detours are lacking, oil short stretches of road half width and establish one-way traffic controls. Post flagmen on these controls to regulate and advise traffic. Printed cards, as per sample, passed out by flagmen may prove beneficial:

—ATTENTION—

THIS ROAD IS BEING OIL TREATED. PLEASE EXTEND YOUR COOPERATION BY DRIVING SLOWLY AND COMPLYING WITH SIGNS.

California Highway Commission.

4. Where controls are impractical, screen both applications.

5. Before oiling, see that sufficient screenings are on hand.

6. If oil is floated over road by unexpected rains, cover with screenings immediately and hold off traffic until covered.

7. Be prepared to screen oil on superelevated curves.

8. Place large 4′ x 6′ wooden warning signs some distance from each end of oiling operations and keep illuminated at night.

Place 15″ x 24″ cardboard warning signs at frequent intervals along the oiled roadway.

9. Have wooden signs neatly painted and cardboard signs printed.

All printed cards may be secured from this office on requisition.

BRIDGE DEPARTMENT NEWS

The Bridge Construction Department has recently taken over the work of foundation investigation at sites of proposed bridges. They are using a calyx core drilling machine recently purchased by the State Testing Laboratory.

John Berg, an expert driller and J. Savage, of the headquarters highway shops, recently with Mr. McKesson in pavement core drilling operations, will assist in this work under the supervision of George J. Porter, who was resident engineer on the structures near San Adro, Monterey County. The crew is now located at Redwood Creek near Orick, Humboldt County.

Guy Mayes, acting resident engineer, has been assigned to the construction of Vejas Creek bridge Road VII-S.D-12-D.

J. M. Kerins, assistant resident engineer, will assist W. A. Douglas in the construction of Santa Ana overflow channel bridge.

Work has been started on the Ben Ali crossing by Frederickson and Watson, of Oakland. The state will be represented by Harry Carter.

Wm. Sutton, formerly employed in the State Testing Laboratory, has been assigned to assist G. W. Thompson on the South San Francisco undergrade crossing. M. J. Christy is also temporarily assigned to this work.

H. A. Farris is a new employee in the bridge construction department.

The contract for reflooring, cleaning and painting the Salinas River bridge at Soledad was recently completed and J. P. Winslow, acting resident engineer in charge of this work, has resumed his duties in the office.

Work of Bridge Engineer Commended.

MR. S. V. Cortelyou, Division Engineer for Division VII, has forwarded to State Highway Engineer, Mr. R. M. Morton, directing to the attention of Mr. James Gallagher, Acting Bridge Engineer, a copy of resolutions adopted by the United Foothill Boulevard Association, which speaks highly of the rapid and efficient work of Mr. C. W. Jones of the Bridge Department.

The resolutions state that due to the speeding-up program adopted by Mr. Jones the bridge in question was opened for traffic sixteen days ahead of schedule.

FOREMAN RECEIVES DESERVED PRAISE.

Wilkie Woodard, Chief Engineer of the Alphonzo E. Bell Corporation of Los Angeles, writes the following very recommendatory letter to S. V. Cortelyou, Division Engineer of Division VII, concerning the efficient work of one of Mr. Cortelyou's foremen, Mr. Stauff:

> During the last storm, which as you will remember was quite severe, I was at Castellammare and saw your foreman, Mr. Stauff, in action. I made up my mind at that time that I was going to write you that I consider him thoroughly efficient, not afraid of hard work, cold and long hours. I noticed how tidily he keeps the shoulders and road bed in his section, and I want to commend him to you, although I think you appreciate his ability."

The new California State Highway Commission building at San Bernardino will be thrown open to the public for inspection on April 30th, in connection with the celebration that will dedicate the new county courthouse.

DIVISION VII MOURNS LOSS OF VALUED FOREMAN

On the 13th of this month the many friends of State Highway Foreman Albert W. Schmuck of Division VII were called to pay their last respects following an accident on the 9th in which he lost his life. He was injured when a road grader struck a rock and tipped over, throwing him head first against a passing car.

During the past ten years, Mr. Schmuck has handled many heavy maintenance and day labor jobs for Division VII. His most recent work, successfully completed, was installing riprap protection and removing slides on the Ventura end of the Coast highway between Las Flores Canyon and Oxnard. He has been working on this Coast highway for two years and was one of the most successful and popular superintendents in the department. He lived in San Gabriel.

NATIONAL RECOGNITION FOR PRISON CAMP ACHIEVEMENT

The "Island Lantern," published monthly by the prisoners at the United States Penitentiary, McNeil Island, Washington, in its April number has a very complimentary article on the results obtained by the Department of Prison Road Camps in California.

Preceding a resume of a report on the work in California the editor of the "Island Lantern" writes:

> The use of prisoners in road building by the State of California has had splendid results. The state has acquired many miles of excellent road; hundreds of prisoners have had all the advantages of the healthiest kind of work in the outdoors under humane conditions and, what is more important, have reaped the rewards of their labor. It is interesting to note that before prisoners were paid their work was not comparable to the work of free men, but under the present pay system their work excels that of free men.

CIVIL SERVICE EXAMINATIONS

Of interest to engineers is the announcement of the California State Civil Service Commission for examinations to be held shortly after the closing date for filing applications, April 30th.

Examinations will be held at Sacramento, Redding, San Bernardino, Bishop, Fresno, Los Angeles, San Luis Obispo, San Francisco and Willits for the following: Junior Engineer Draftsman, Grade 1, salary, $75 to $130; Assistant Civil Engineer Draftsman, Grade 2, salary, $135 to $165; Civil Engineer Draftsman, Grade 3, salary, $170 to $230; Assistant Electrical Engineering Draftsman, Grade 3, salary, $170 to $230; Electrical Engineering Draftsman, Grade 3, salary, $170 to $230; Mechanical Engineering Draftsman, Grade 3, salary, $170 to $230.

Examinations will also be held at Sacramento, San Francisco and Los Angeles for the following testing laboratory positions, the last day for filing applications being May 10th: Laboratory Aid, Grade 2, salary, $135 to $165; Junior Testing Engineer, Grade 3, salary $170 to $230; Assistant Testing Engineer, Grade 4, salary, $235 to $280; Associate Testing Engineer, Grade 5, salary, $285 to $350.

NEW HIGHWAY ENGINEER FOR NEVADA.

It is reported that S. C. Durkee, Division Engineer for Reno, Nevada, section, will on June 1st succeed George W. Bordon as Nevada State Highway Engineer.

WHAT THE DIVISIONS ARE DOING

DIVISION VI.

HEADQUARTERS, FRESNO.

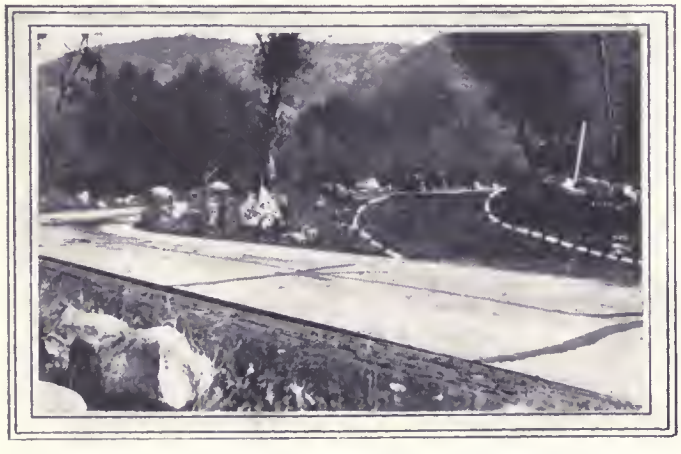
E. E. WALLACE, ACTING DIVISION ENGINEER.

Counties of Fresno, Madera, Merced, Mariposa, Kings, Tulare, and Kern, north of the Tehachapi.

DIVISION VI is starting a heavy shoulder oiling program along Route 4. A great deal of work has been done since the first of the year in improving drainage conditions, eliminating irrigation ditches and borrow pits along the right of way and crowning the roadway out to the fence line. That the work is appreciated by the travelling public is evidenced by the number of favorable comments received.

While at work at rock quarry No. 4, located on state highway near Clearinghouse, G. W. Cave, a convict laborer, was killed by falling rock. The rock was imbedded in the hillside and fell suddenly, giving the laborer no chance for escape.

MASONRY RUBBLE WALL—Located on Merced-Yosemite highway near the confluence of Bear Creek and the Merced River, completion of which is reported by Acting Division Engineer E. E. Wallace of Division VI. Last year, Bear Creek, when in flood, caused a severe wash-out and to prevent recurrence, a rubble masonry wall 500 feet long and approximately 14 feet high was constructed. The footings required removal of approximately 1900 cubic yards of rock and earth, which work was performed by a 1¼-yard steam shovel. The wall required 1600 cubic yards of masonry and it is found that the total cost was $8 per cubic yard. Skilled masons were employed for the masonry work but common labor was performed by convict laborers. The material for wall was secured from a quarry site located in Bear Creek opposite the wall.



CURVES ARE DANGEROUS—Here's one of the many on Route 10, Division VI, Sierra-to-the-Sea highway, that is being widened and strengthened by the placing of a water-bound macadam base which it is proposed to cover with an oiled surface later in the season.

Allotments have been received for oiling of Merced-Yosemite lateral between Mormon Bar and El Portal, a distance of 32 miles. This entire distance has been gravelled or is now in the process of being gravelled. From Mormon Bar to a point 10 miles east, the oiling work will be done under the penetration method as the gravel is now in place and benefit of the winter rains was received to assist in compaction. From this point to El Portal, the mixing method will be used. Approximately one-half million gallons of 60-70% asphaltic road oil will be required for the work. The section of the road near El Portal has received the full 6-inch thickness of gravel and oiling will be started within the next few days.

Widening the roadway from 18 to 20 feet and reducing the present high crown and superelevating curves is now in progress on the Merced-Yosemite lateral between Cathay and Mormon Bar.

DIVISION VII.

HEADQUARTERS, LOS ANGELES.

S. V. CORTELYOU, DIVISION ENGINEER.

Counties of Los Angeles, Ventura, Orange, San Diego, and eastern Kern, south of Mojave.

MAINTENANCE CREW TO THE RESCUE—Stages attempting to ford the stream in the Arroyo Seco, Los Angeles County, during a recent storm, met with disaster. Wire and plank suspension bridges constructed by the state highway maintenance crew enabled pedestrians to cross the flood-swollen stream.

LIGHT SHOVELS EFFICIENT—Slide material which came down on the Ridge Route during recent storms is being removed by two light gas shovels and dump trucks. These small shovels work in close to the bank on this mountainous section of highway without interference to the traffic.

On the Jahn and Bressi contract for the paving of Mountain Springs grade in San Diego and Imperial counties, good progress is being made. Two miles of 20-foot concrete pavement is now complete and open to traffic, and in addition, nearly three miles of half-width, 10-foot pavement is in place.

The 3.2 miles of 30-foot concrete pavement on the contract for reconstructing Whittier Boulevard in Los Angeles County, between Michigan avenue, Whittier and the Orange County line, has been completed and opened to traffic. This contract was extended to include the widening of the existing 23-foot concrete pavement to 30 feet by the addition of flush concrete shoulders, which are completed from the county line, a distance of a half-mile to La Mirada street in La Habra. Work is now in progress on the crushed rock shoulders.

Practically all concrete is now in place on the paving contract of the Griffith Company from the easterly limits of Santa Ana to Tustin, Orange County.

Placing of concrete paving is in progress on the reconstruction of the Coast highway westerly from Ventura, the paving back of the "Long Seawall" having been completed. Contractor Knapp's concrete crew was temporarily disorganized as a result of an accident which killed three and sent ten of his men to the hospital when a stage collided with the truck in which the men were riding.

The construction of the approaches to the new Carlsbad overhead crossing of the Santa Fe tracks is now in progress.

Work is under way on the reconstruction of the state highway in San Diego County, between La Mesa and El Cajon.

It is with regret that we announce a serious accident in which the seven-year-old daughter of Assistant Resident Engineer W. I. Templeton was so severely burned, that it may result in the loss of her arm.

DIVISION X.

HEADQUARTERS, SACRAMENTO.

R. E. PIERCE, ACTING DIVISION ENGINEER.

Counties of Amador, Calaveras, Alpine, Tuolumne, Stanislaus, San Joaquin, Solano, and southern Sacramento and Yolo counties.

THE work of widening Priests Grade which was started in December, 1926, is now entirely completed. The entire 7-mile grade now has a minimum width of 20 feet and all blind curves have been eliminated so that this grade can now be considered safe for even timid drivers. The work of placing guard rail on Priests Grade along the river near Jacksonville and on Shawmut Grade is now under way. A small gas shovel is at work on two of the worst points near Jacksonville where the road is very narrow and the curves absolutely blind. All improvement work in this connection will be completed before the regular summer tourist travel commences along this road.

During the fall of 1926, work was started on the Mother Lode highway between Plymouth and Cosumnes River to build a new section of the highway on new location to eliminate two very bad creek crossings. This work was held up during the rainy season. It is again under way and will be completed in the early spring. Maintenance crews have been busy during the last three months in preparing several of the graveled roads in Division X for surface type oiling. This work is now practically completed and oiling operations are scheduled to commence on April 15th.

Division X is glad to report the return to work of F. C. Hewitt, even though he is still limping.

Mr. A. D. Murray is a recent addition to the Division X drafting force.

"So Much" Rope.

Willie—"Pa sent me for a piece of rope like this."
Hardware Dealer—"How much does he want?"
Willie—"Just enough to reach from the goat to the fence."—Exchange.

DIVISION IV MAKING RECORD IN MAIL BOX ARRANGEMENT

Before arranging mail boxes.

After arranging mail boxes.

POSTMASTER George P. Lovejoy of Petaluma is so well pleased with the neat arrangements of the rural mail boxes on the state highway in his territory, which is in Division IV, under Division Engineer John H. Skeggs, that he has arranged a neat display by means of photographs and forwarded them to Mr. Skeggs, who in a letter to the Sacramento office commends the work of Mr. T. H. Dennis, Acting Maintenance Engineer.

A glance at the "Before" and "After" pictures sent in by Postmaster Lovejoy is convincing that such common articles as mail boxes can be made to add to the beauty of the scenery on the famed Redwood highway. In his short letter Mr. Lovejoy writes:

> "I note with a great deal of pride the creditable attention given to the rural mail boxes on the Redwood highway. I wish to express my hearty appreciation for your cooperation in the matter, and to assure you of our continued best efforts in behalf of your excellent work."

In Days Of Old.

When Noah sailed the ocean blue
He had his troubles same as you;
For days and days he drove the ark
Before he found a place to park.—Azuride.

STATE HIGHWAY FUND CONTRACTS (Bond Funds, Including Federal Aid)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE MARCH 9, 1927. None.						
					AWARDED SINCE MARCH 9, 1927.						
520	VIII	Imperial	25	F	Between Adams Ave. and north limits of El Centro	0.50	Grading and Rock Surfacing	C. E. Pitzer	$9,053 76	Mar. 28, 1927	60
521	VII	Orange	2-60	A-C	Between San Juan Creek and Serra	0.67	Grading and P. C. C. Pavement	V. R. Dennis Const. Co.	98,364 94	April 13, 1927	150
						0.25	Grading and Bit. Macadam Pave.				
					Total State Highway Fund Contracts Awarded	1.42			$107,418 70		

NOTE.—Primary construction covered by the above contracts does not include funds obligated on cooperative forest highway projects, prison camp road activities, or day labor jobs not being done under contract.

STATE HIGHWAY MAINTENANCE FUND CONTRACTS (Including Gasoline Tax Fund)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE MARCH 9, 1927.						
M-116	VII	Los Angeles	2	D	Across the Rio Hondo, near Los Angeles		Widening existing bridge	Gutleben Bros.	$96,545 81	April 5, 1926	
M-122	V	Santa Barbara	2	K	Between Santa Barbara and Goleta	5.11	P.C. Conc. Wide. and Asph. Conc.Sur.	Cornwall Const. Co.	174,167 40	May 7, 1926	
M-150	VII	Los Angeles	4	E	Across La Placerita Cr. ½ mi. north of Newhall		Two Concrete Slab Bridges	I. P. Lipp	17,926 54	Oct. 12, 1926	
M-155	VII	Los Angeles-Ventura	2	C-B	Between Calabasas and Camarillo		Widening and Repairing Four Bridges	Henry Auerbach	23,989 78	Oct. 29, 1926	
M-157	VII	Los Angeles	9	E	Across Eaton Canyon Wash		Reinforced Concrete Bridge	Sidney Smith	36,499 50	Oct. 29, 1926	
					AWARDED SINCE MARCH 9, 1927.						
M-165	II	Siskiyou	3	A	Line change near Weed	0.22	Grading and Rock Surfacing	J. P. Brennan	$9,083 25	Mar. 28, 1927	60
M-166	II	Tehama	29	A	Paynes Creek Maintenance Yard		Maintenance Buildings	Martin Const. Co.	4,095 00	Mar. 23, 1927	65
M-167	III	Sacramento	3	B	One mile south of Ben Ali		Undergrade Crossing	Fredrickson and Watson	52,167 66	April 13, 1927	150
					Total State Highway Maintenance Fund Contracts Awarded	0.22			$65,345 91		

NOTE.—The above obligations charged against the State Highway Maintenance Funds do not include funds from those sources obligated for general maintenance and for specific betterments being done under day labor authorization.

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CALIFORNIA HIGHWAYS

A BULLETIN ISSUED BY THE CALIFORNIA HIGHWAY COMMISSION FOR THE INFORMATION OF ITS EMPLOYEES AND THE PUBLIC

Vol. 4 MAY, 1927 No. 5

THE MARCH OF PROGRESS—A giant of the Redwood highway section where a number of important contracts for state road work will be in progress this season.

CALIFORNIA HIGHWAYS

This Bulletin is published by the California Highway Commission for the information of its employees and the public. Editors of newspapers and others interested are welcome to use, without restriction, any of the matter herein contained. Cuts will be gladly loaned upon request.

J. P. HALL - - - - - Editor
P. O. Box 1103, Sacramento, California.

Vol. 4. MAY, 1927. No. 5

CALIFORNIA HIGHWAY DEPARTMENT

C. C. YOUNG, Governor.

CALIFORNIA HIGHWAY COMMISSION
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J. P. BAUMGARTNER, Commissioner, Santa Ana
M. B. HARRIS, Commissioner, Fresno

R. M. MORTON, State Highway Engineer, Sacramento

HARRY A. ENCELL, Attorney, San Francisco
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T. H. DENNIS, Acting Maintenance Engineer
C. L. McKESSON, Materials and Research Engineer

WILLIAM SCHLEIP, Principal Accountant
BEN H. MILLIKEN, Superintendent of Prison Road Camps

DIVISION ENGINEERS
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H. S. COMLY, Division II, Redding
F. W. HASELWOOD, Division III, Sacramento
J. H. SKEGGS, Division IV, San Francisco
L. H. GIBSON, Division V, San Luis Obispo
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S. V. CORTELYOU, Division VII, Los Angeles
E. Q. SULLIVAN, Division VIII, San Bernardino
F. G. SOMNER, Division IX, Bishop
R. E. PIERCE (Acting), Division X, Sacramento

General Headquarters, Third Floor, Strub Bldg., Eleventh and P Streets, Sacramento, California.

EVERY employee of the highway commission has a direct interest in the improvement of the highway organization's methods and results, both engineering and clerical, office and field. To that end, the State Highway Engineer invites constructive criticism or suggestions from every employee.

Ideas as to the more economical and efficient handling of your job, or suggestions for elimination of waste will be welcomed. Criticism is also desired from persons outside the organization, who are in a position to give facts.

Send only signed communications addressed as follows: California Highways, P. O. Box 1103, Sacramento, Cal.

BUILDING SAFETY INTO CALIFORNIA MOTOR ROADS

CALIFORNIA HIGHWAY engineers are recognizing as never before the fact that building for safety is one of the greatest responsibilities resting upon them in developing the road program of the state. They are making every effort to build safety into the road rather than depend upon warning signs and devices alone to protect the motorists.

Relocating the main roads to eliminate curves, to avoid railroad grade crossings and to reduce steep grades is now a large part of our engineers' work. Incidentally, these relocations save distance, avoid costly bridges and mean benefit to the motorist in the cost of vehicle operation.

The frequency of highway accidents resulting from traffic congestion has demonstrated not only that we must construct our new highways of ample width, but also that we need to widen many of the roads and bridges now in use. This has led to the construction in the vicinity of large industrial centers and on main thoroughfares of what is known as the "superhighway" to insure the maximum road capacity, speed and safety.

Our highway engineers are bringing science to bear upon the solution of the problems of highway safety. Today, but a very small percentage of accidents on our main roads can be attributed directly to engineering defects. No public work is of greater importance than that of widening and extending our present roads, as well as paving new ones, to meet our constantly increasing need for adequate highway facilities.

COMMENT.

In commenting on the personnel of the State Highway Commission the Chico Enterprise says: "The members of the State Highway Commission coming, as they do, from Humboldt, Fresno and Orange counties are geographically as well as personally ideal."

We pay for good roads whether we have them or not, but we pay more when we do not have them. A road, after it is improved, pays for itself many times over.

The policy of the California Highway Commission to secure adequate width for all state roads will save the state a great deal of money and future legal troubles. In the city of Pittsburgh, Pa., it recently cost $1,620,000 to widen a short section of street to 80 feet.

It pays to meet traffic demands. At least Chicago thought so when she spent $8,250,000 for Wacker Drive, an elevated street.

The Missouri state highway commission is instituting the new methods of opening bids "in public;" that is, by having their proceedings broadcasted by radio. This is further evidence that "show me" originated in Missouri.

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MAY
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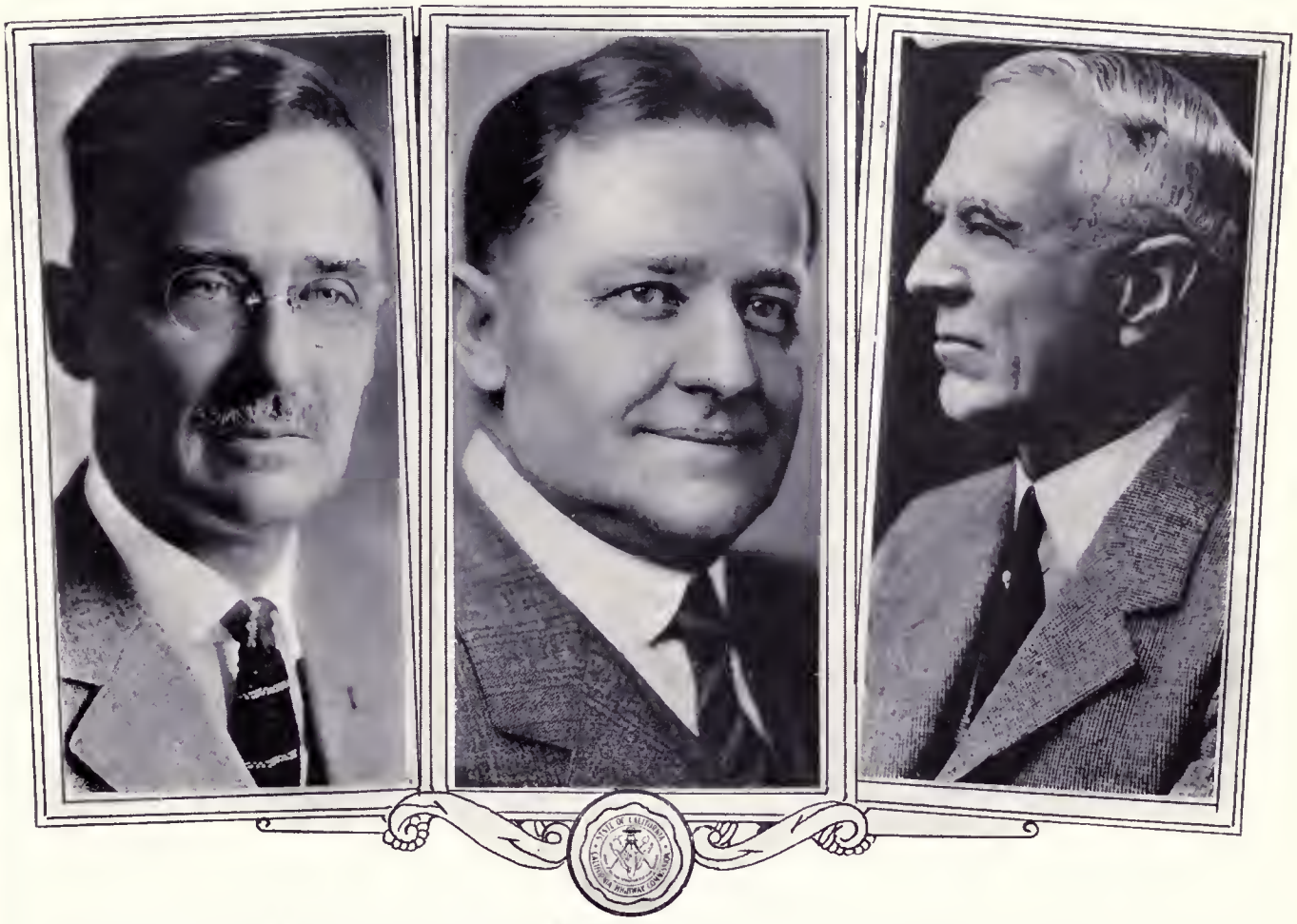
California Highways

VOL. 4
NO. 5

Commission Confronted With Many Big Problems



CALIFORNIA HIGHWAY COMMISSIONERS—*Left,* Senator M. B. Harris, of Fresno, Fresno County; *Center,* Ralph W. Bull, of Eureka, Humboldt County, Chairman; *Right,* J. P. Baumgartner, of Santa Ana, Orange County.

DURING THE next decade the work confronting the California State Highway Commission is of stupendous proportions. Surveys made by the Commission bear out the reasonableness of the multitude of requests which, with many other factors, mark the immediate future as one brim full of problems for the state's road builders.

During the past few years lack of funds for new construction has slowed up the expansion of the system to almost a standstill. Progress was so far hampered as to last year put all other states but one ahead of California in new construction. In the meantime the state continued to develop, her need for new state roads multiplied and the Commission is now called upon by many localities to build the roads they expected some years ago.

The increase in auto traffic, and especially heavy truck traffic, presents another serious problem. It has been far greater than highway expansion and now the Commission must spread available funds in such manner as to relieve traffic congestion in many parts of the state and yet build highways of proper standards. A concrete example of such a condition was noted at Los Angeles on Sunday, May 1st. Many city autoists who went out for a short ride on the state highway through Saugus and Newhall could not get back to their homes until the next day, although they were but a few miles out of the city. A total of 25,000 cars passed through the Newhall Tunnel, which is but 16 feet wide; and those who did not get through waited till Monday morning. This route is now the only entrance to Los Angeles from the San Joaquin Valley. San Francisco, too, is confronted with a similar problem in handling her peninsular traffic and while steps must be taken to give relief, much care must be used in authorizing the expenditures.

While the cities are wrestling with their traffic problems and asking state aid the back country is calling for certain of their designated state highways to be built and maintained. They rightfully contend that if the state is to be developed it must be traversed with proper highways. Motorists who are paying for highways with their gas tax demand access into new pleasure grounds. Many towns and cities want rerouting to be relieved of traffic while many more want to get into the traffic. Bridges, which before heavy trucking came into vogue were adequate, are now a menace when subjected to full legal loads.

Surely the problems of the highway commission are many, varied and difficult.

NEARLY $3,000,000 STATE ROAD WORK AUTHORIZED

THE RECENT ruling by Attorney General U. S. Webb that the State Highway Commission need not wait the next biennium, before awarding contracts to be paid for out of the revenues of that period opened the way for the Commission to get much of this year's work under way in time for completion before winter.

About $3,000,000 in reconstruction was authorized at the last two meetings of the Commission. Plans, specifications and bids were directed on the following projects:

SAN JOAQUIN COUNTY (Route 4)—Bridge across Stockton diverting canal, on the proposed new entrance to Stockton from the north.
Reconstruction of 2.4 miles between Stockton and Cherokee Station.

GLENN COUNTY (Route 7)—Bridge across Wilson Creek.

CONTRA COSTA COUNTY (Route 14)—Bridge across Wildcat Creek.

SAN MATEO COUNTY (Route 2)—Paving between Colma and Cypress Lawn cementery, for distance of 1.6 miles. San Francisco, San Mateo County, the Market Street Railway and the state cooperating on this project.

SHASTA COUNTY (Route 3)—Reconstruction of 8.8 miles between La Moine and Mears Creek.

SAN DIEGO COUNTY (Route 2)—Reconstruction at Del Mar overhead crossing approaches, 0.87 miles.

MONTEREY COUNTY (Route 2)—Reconstruction of 1.86 miles between Salinas and Santa Rita highway.

EL DORADO AND PLACER COUNTIES (Route 38)—Rock surfacing between Meeks Bay and Tahoe City, 11.2 miles.

PLUMAS COUNTY (Route 29)—Grading construction from easterly end of Lake Almanor causeway to Chester Grade, 0.86 miles.

ORANGE COUNTY (Route 2)—Reconstruction of 5.68 miles from Irvine Crossing to one mile north of Galivan.
(Route 60)—Construction of creosoted pile trestle bridge and bulk heads over westerly channel of San Juan Creek.

SAN LUIS OBISPO COUNTY (Route 2)—Reconstruction of grade and surfacing 0.18 miles, 1.9 miles north of San Luis Obispo.
(Route 2)—Reconstruction of 10.73 miles between Pismo and San Luis Obispo.

SANTA BARBARA COUNTY (Route 2)—Grading and surfacing 0.31 miles.

KERN COUNTY (Route 4)—Reconstruction of 18.48 miles between Lerdo and Delano.

LOS ANGELES COUNTY (Route 61)—Retaining walls on Arroyo Seco Road.

HUMBOLDT COUNTY (Route 1)—Bridge across Redwood Creek near Orick. (County donation.)

MODOC COUNTY (Route 28)—Bridge across Rattlesnake Creek. (County donation.)

COLUSA COUNTY (Route 7)—Bridges at Stone Corral and Funk Slough.

SACRAMENTO AND PLACER COUNTIES (Route 3)—Reconstruction of 3.08 miles, Sylvan School to Roseville.

ALAMEDA AND SANTA CLARA COUNTIES (Route 5)—Reconstruction of 4.45 miles, Warm Springs to Milpitas.

ALAMEDA COUNTY (Route 5)—Reconstruction of 7.8 miles, Dublin to Hayward.

IMPORTANT CONTRACT AWARDED FOR REDWOOD HIGHWAY UNIT

THE AWARDING of the contract for the grading and surfacing of 14.9 miles of the Redwood highway from Orick to the northerly boundary line of Humboldt County will be good news to all interested in the improvement of the state highway system up in the redwoods. In addition to this contract, which went to W. H. Hauser of Oakland for $439,809, against an engineer's estimate of $464,104, the clearing of the right of way was made a separate contract, the Englehart Paving and Construction Company now doing the work. A bridge across Redwood Creek, to be built by Humboldt County, is also included in the project.

The Hauser bid was made with a time limit on the job placed at 350 working days, but following the receipt by the Highway Commission of many requests from civic organizations along the Redwood highway from Marin to Del Norte counties, Mr. Hauser agreed to a cut in the time to 175 days which will assure the completion of the unit this season.

CONSTRUCTION DEPARTMENT, TAKE NOTICE.

The oldest pavement in the United States laid at Bellefontaine, Ohio, in 1894, recently underwent crushing tests which showed an average strength of 5400 pounds per square inch.

'Twas Ever Thus.

When the plumber makes a mistake he charges twice for it.

When a lawyer makes a mistake it is just what he wanted, because he has a chance to try the case all over again.

When a carpenter makes a mistake it's just what he expected.

When a doctor makes a mistake he buries it.

When a judge makes a mistake it becomes the law of the land.

When a preacher makes a mistake nobody knows the difference.

But when an editor makes a mistake—Good Night!—Keystone Topics.

RINDGE RANCH CONFERENCE

ONE OF the important results that evolved from this month's meeting of the California Highway Commission at Los Angeles was the creation of a better feeling between the state and the stockholders of the Rindge Estate Company regarding matters connected with that section of the Oxnard-Capistrano highway between Los Angeles and Oxnard, now being built through this famous ranch which skirts the Pacific for a distance of twenty miles.

For several years past the state has been at work on this section which will give another much needed entrance to Los Angeles from the north. However, due to unsettled matters regarding rights of way, details of location and the use of water and construction materials found on the property, much misunderstanding arose previous to and following court actions, with no indications of a settlement agreeable to all concerned.

At request of prominent Los Angeles citizens representatives of the Rindge Corporation came to Sacramento to arrange the conference, which took place on the 12th instant on the Rindge Estate. All stockholders of the company, the Commission and secretary, and the State Highway Engineer were present, participating in a friendly and open discussion of all points at issue and viewing the uncompleted 14 miles of highway within the boundaries of the ranch. Following a complete discussion of the heretofore disputed points it was agreed that the Rindge interests are to immediately formulate their desires on the matter in writing and file same with the Commission for its prompt decision.

All who attended the conference expressed the hope that a complete agreement will be reached upon the points at issue, so that this new road, which means so much not only to the state but also to the Rindge interest, will see an early completion.

The California Contractor recently gave space to a story on the new division headquarters at San Bernardino, stating that the new buildings are a credit to the entire state.

SHADE TREES FOR CALIFORNIA STATE HIGHWAYS

SHADE TREE SCENES ON CALIFORNIA STATE HIGHWAYS—(1)Tank truck for irrigating trees in operation in Division VI. (2) European Sycamores planted in February, 1923, by the Turlock business men. They have been under the care of Maintenance Foreman L. P. Laird and show an excellent growth. (3) Forest scene on Redwood highway, Division I, where Mother Nature has provided the trees. (4) Highway trees in Riverside County, Division VIII. (5) and (6) Young Sycamore trees between Lodi and Mokelumne River, San Joaquin County, Division III. (7) Four-year-old black locust in Merced County planted by Delhi, Turlock and Livingston. (8) A newly planted sapling ready to begin the life in Kern County, Division VI. Note the shapely pruning.

Reported by W. E. GLENDENNING, State Highway Arboriculturist.

SYSTEMATIC tree planting for road beautification began in 1920. By 1922, 100 miles had been planted. At the present time, the Highway Commission is maintaining 56,400 trees on the state highways covering a lineal distance of approximately 685 miles. Generally the trees are spaced at 50-foot intervals, being placed alternately on the right and left sides of the roadway with the necessary elimination for visibility at crossings and road intersections.

These plantings are distributed among the several highway divisons as follows:

	Headquarters	Trees	Miles
Division	I Willits	1,230	6
Division	II Redding	1,451	17.5
Division	III Sacramento	9,151	88.45
Division	IV San Francisco	10,768	242.30
Division	V San Luis Obispo	280	2.50
Division	VI Fresno	7,835	54.65
Division	VII Los Angeles	3,742	51.40
Division	VIII San Bernardino	12,937	142.30
Division	IX Bishop	No trees planted	
Division	X Sacramento	9,011	79.90
Total		56,405	685

In addition to the above, a careful estimate of former planted and natural trees within the highway right of way gives a number far in excess of those listed, the care of which involves a project of considerable magnitude. This is usually assigned to the individual foreman. Assisting in the direction of this work is an arboriculturist reporting to the maintenance engineer. Special tree-watering equipment with movable discharge pipe has been developed which enables the watering to be performed from the driver's seat, a tank truck of 1200 gallons usually being sufficient to water from thirty to forty trees. Aside from irrigation and cultivation, many precautions are necessary for the protection of young trees against insect pests, damage by squirrels, gophers, moles and loose stock driven along the highway. The hazard of fire is also great.

(Continued on page 8.)

Romance of Transportation in California

PART II.

By F. W. Haselwood, Division Engineer, Division III.

Note.—The first installment of this most interesting history appeared in the April issue.

AS RIVER navigation was monopolized, so the California Stage Company and the Pioneer Stage Line absorbed the land transportation. This was not the case, however, with freighting. Mule teams, and many of them with no organized control, crowded the streets of the growing mining towns and after supplying their wants, passed on to more scattered communities. A string of jingling bells, arched over the leaders' collars, gave notice of their approach.

F. W. Haselwood.

This freight system needed roads, many of which were kept in excellent condition being toll roads. Well-graded roads also accommodated six-horse teams attached to twenty-four-passenger stage coaches, although at places they were narrow enough to give the patrons a thrill. On level or down-grade road the animals went at break-neck pace, with the skilled driver cracking his long lash close to their ears. No stage coaching ever surpassed that of those early days in California.

Postal service in these days was another problem. The first gold seekers waited six months to a year for a letter from home. Uncle Sam was slow at first to improve the service but upon our admission to the Union a mail route, San Francisco to Fort Bridges, via Salt Lake, was established. A. Woodward and George Chorpening had the first mail contract in 1851 for $14,000, running from Sacramento to Salt Lake via Placerville, Hope and Carson valleys and the Hastings Cut-off, a distance of 750 miles. Mail pouches were carried on mules once a month each way, accomplishing the remarkable feat of crossing the Sierras in the dead of winter. John A. Thompson, a hardy Norwegian, crossed the 90 miles from Carson Valley to Placerville on skis in three days, carrying the mail pouch.

Covered wagons for mail and passengers followed the mule, but were not popular. Many schemes were proposed, one by the Sacramento Union in 1855, which estimated a daily mail to the western end of the railroad at the Missouri River at $750,000. Monthly expenses were figured at $57,000 and revenues at $72,000. In 1855 Wm. N. Walter proposed to the California Legislature to establish a mail line with dromedaries between St. Louis and the coast, but his unusual plans never materialized.

Discussions of the mail problem naturally brought up the subject of better roads and in 1855 the California Legislature ordered a survey and appropriated $50,000 for improvement of the old emigrant road between Placerville and Carson Valley, the state's first venture in road building. In 1858 it became a toll road operated by El Dorado County.

In 1859 General Johnston began the investigation of a shorter route, cutting off 145 miles by a route through Ruby Valley. His survey led to an established route of 565 miles.

A semi-weekly service to St. Joseph, Missouri, came with the construction of a road from Placerville to Genoa in Carson Valley, Nevada. In 1859 a service every 17 days was accomplished. That same year saw the Nevada mining rush via Placerville and the coming of the Pony Express. By 1860 the Placerville route had been permanently established. Engineers were employed to reduce the grades, the roadway widened and substantial bridges built. Parts of the road were even macadamized. The road was sprinkled in summer and kept free from snow in winter, all expense of maintenance being met by tolls.

Samuel Bowles, editor of the Springfield, Ohio, Republican, described a trip he made over the road, marveling at making 75 miles in 7 hours, from Tahoe to Placerville.

The roads of those days were developed as a result of the public demand for service much as road work is done today, the difference being that these early roads were developed by private enterprise and paid for by tolls collected from the traffic that used them. These tolls not only paid for construction and a high type of maintenance but brought the owners a small fortune each year. In the early days, therefore, the user not only paid for construction and maintenance but a large profit as well. It is of record that the amount collected as tolls in 1863 was approximately $600,000.

Thus was a great transportation emergency met and overcome in these early days and a great commercial road developed to be surpassed in importance only by the building of the Central Pacific Railway. During its period of service this road carried an astonishing volume of traffic. The Pioneer Stage Company operated four stages daily each way between Placerville and Carson City. Six hundred horses and fifty men were employed by the company. The receipts from freight, passenger and express business exceeded $4,000,000 per year in 1861 and 1862. Authorities fix the amounts collected in 1863 as from $12,000,000 to $13,000,000. The road was traversable throughout the year. There were 93 hotels en route for the convenience and comfort of traffic. Stage stations were usually about 12 miles apart and teams were changed with lightning speed. The average rate of travel for stages was about 10 miles per hour.

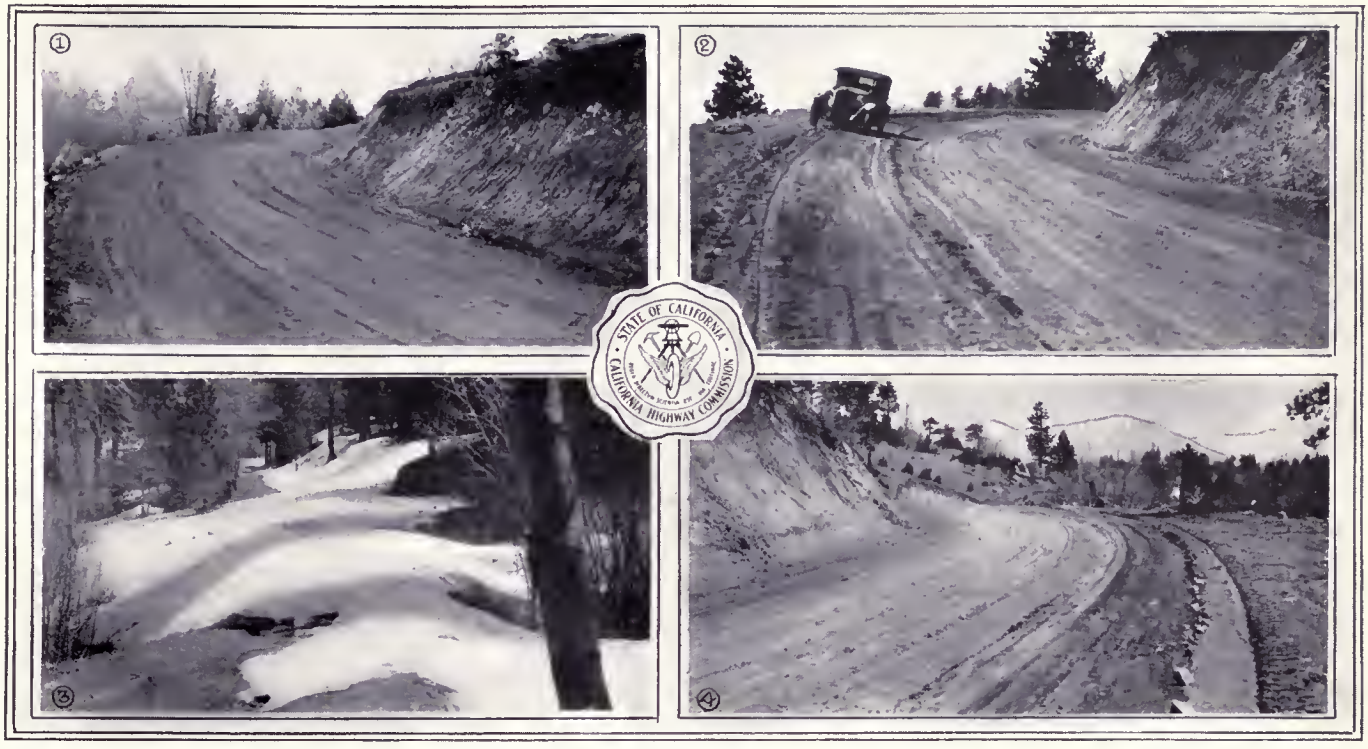
In 1864 the Central Pacific was building from Sacramento to Dutch Flat and with the construction of a road from there over Donner Pass, the toll business over the Placerville road came to an end. As more rails were laid, team hauls were shortened and soon passed out entirely.

But the Placerville route remains and today is designated as the Lincoln Highway. It serves an entirely different traffic, both competing with and supplementing its rival the Victory Highway by way of Auburn and Truckee. Although it is also a through road, its greatest function is as a recreational road, taking ever increasing numbers from the interior valleys away from the heat of summer and grind of business to the bracing atmosphere of the mountains.

In recent years automobile traffic has developed to a volume far greater than the road carried in its palmiest days, but with less congestion, due to increased width of roadway and greater speed of traffic, but there is a corresponding continual and increasing demand for improvement of the road and for elimination of dust. The latter was to a considerable extent

(Continued on page 8.)

IMPROVEMENTS FOR "RIM OF THE WORLD" DRIVE



RIM-OF-THE-WORLD DRIVE—(1) Typical view of present improvement. (2) A superelevated curve and widened roadway. (3) Snow covering old road, April 15th, 1927, avoided by new routing on south slopes. (4) View of the improved road and snow-clad mountains showing wide space on the right for parking. Note the absence of snow in the foreground—Routed upon a south slope.

Reported by E. Q. Sullivan, Division Engineer, Division VIII.

AT AN altitude of over 6,000 feet above the sea, with a panoramic view of orange groves and fair Southern California cities stretching beneath it, the "Rim of the world" drive, in San Bernardino County, is now undergoing reconstruction which will give this noted resort land better and modern road facilities. The present work, while only a beginning of contemplated improvements, will make the drive a "high-gear" road and, being routed over the south slopes, greater possibilities for winter travel will be assured.

This route became a state road by an act of the legislature in May, 1917. Increase in population and wealth in this region and the demand for summer homes on the uplands, made it imperative that the state take steps to establish its road with adequate right-of-way and proper alignment.

This drive, also known as the "Crest," begins at Waterman Canyon, the end of San Bernardino's county highway system, and follows the old "Crest" route, to Bear Lake. Section "A" ascends to the summit of the San Bernardino mountains, ending at Squirrel Inn. Section "B," the part now under construction, meanders along the crest of the ridge to Running Springs Park. Section "C," which was built under the direction of the U. S. Bureau of Public Roads, with state aid, in 1923 and '24, crosses a higher range to the dam at the lower end of Bear Lake; "D" and "E" following the north and south sides of the lake respectively.

The reconstruction on Section "B" is now being done by day labor, a ¾-h.p. gas shovel being used. The first allotment of $25,000 carried the work to March 15th, and an additional $10,000 is supplying funds till July 1st, this year.

ROAD LOSS IN SOUTHERN STATES IS TERRIFIC.

Twelve hundred miles of main highways have been rendered impassable and thousands of miles of secondary roads have been put out of commission in the area affected by the breaking of levees and overflowing of the Mississippi River and tributaries, according to a survey of the roads of six states made by the National Touring Board of the American Automobile Association.

FRESNO PAPERS EXTEND COURTESY.

The Bulletin was last month indebted to the Fresno Bee for the use of the cut of the old Herndon Bridge and to the Fresno Republican for the front page airplane view.

Rubber Paving Blocks.

Road builders will be interested in the invention in Manchester, England, of rubber-faced paving blocks for highways. To prove that these blocks will reduce dust, noise and the danger of skidding, the inventor is paving a London street with them at his own expense.

The success of his experiment would perhaps solve the matter of the disposition of our discarded tires.

Superior First Aid.

Nell: "If a man tried to flirt with you, would you call a policeman?"

Bell: "No, a minister."—Florida Times-Union.

"TOGETHER" SPIRIT NEED IN ROAD BUILDING

(From the Los Angeles *Illustrated Daily News.*)

"COOPERATION and recognition of mutual problems form the key to successful highway work, members of the County Supervisors' Association of California have been told by Governor Young, State Highway Commissioner Baumgartner and Highway Engineer Morton. This fact is obvious. and absence of such cooperation at times has been a great drawback to efficient highway construction in this state.

Especially in regard to county-built roads has fault been found. Heretofore each county has built its state-aided roads without much regard to state approval or the convenience of adjoining counties. The state's share of the gasoline-tax revenue is spent on roads designated by the legislature, and it would seem wholly proper that the counties' share be spent in agreement with the state and with one another. If this were done, there can be little doubt that better coordinated improvements would be assured, on the heaviest lines of local traffic.

SHADE TREES FOR CALIFORNIA HIGHWAYS

(Continued from page 5.)

Particular attention is given the location of the plantings with reference to the pavement so that it will present no interference with its ultimate width. With this in mind, new plantings are discouraged on rights of way of less than 80 feet. In Division VIII, plantings adaptable to desert sections are propagated by the division itself. A small nursery has been established at the division headquarters at San Bernardino.

As load clearances require a clear height of 12 feet above the pavement, systematic pruning and trimming is being followed to provide this clearance and at the same time develop a symmetrical, worth-while tree. Where power or telephone lines occur within rights of way planted to trees, the tree height is limited to 40 feet, and all trimming for wire clearance is done under permit and inspection, to the satisfaction of the Highway Commission.

The state itself makes no original plantings, but does not discourage plantings by civic or other public bodies. Trees are usually secured at a nominal price from the state nursery located near Davis. The planting and care of trees during the first year is handled by interested parties or the task may be assigned to state forces by the payment of a specific sum per tree planted and maintained. After the first year's maintenance, the state assumes the burden of care and replacement in event of loss of trees.

The following species have proven their suitability in the different sections of the state as follows:

Valley section: European Sycamore, California Black Walnut, Black Locust, Blue Gum, Red Gum, Olive, Carolina Poplar, Lombardy Poplar, Silver Maple, Arizona Ash, Valley Live Oak. Of the above, the European Sycamore, Black Walnut, Arizona Ash and Black Locust are preferable.

Coastal section: Coast Redwood, European Sycamore, Black Walnut, Blue Gum, Red Gum, Coast Live Oak, Silver Maple.

Desert section: Black Locust, Arizona Ash, Blue Gum, Red Gum, Black Acacia, Athol.

Owing to the susceptibility of the Elm to the present wide spread bettle infestation, the planting of this tree in any section of the state is not advisable.

During the present season some 500 new trees have been planted, located mainly at Live Oak, Sutter County, Williams, Colusa County, and Soledad, Monterey County. Applications for additional plantings have been postponed due to the lateness of the season. It is best for community organizations interested in planting trees on the state highway to make their plans a year in advance of the planting. Present conditions indicate a successful season for tree propagation.

SAN GABRIEL DAM TO BE WORLD'S LARGEST

FIGURES on the proposed San Gabriel flood control dam, authorized by the Los Angeles County Board of Supervisors on May 18th, mark it as the largest project of its kind in the world. Bids for its construction will be received on July 11th.

The monster dam will cost $25,000,000. It will be 385 feet above stream level and 438 above bedrock. Other measurements are: 2200 feet across top; 700 feet at bottom; 360 feet thick at bottom and 30 feet at top. The work will involve 1,350,000 cubic yards excavation, 3,250,000 cubic yards mass concrete and 3,500,000 pounds metal. Cement to the amount of 2,500,000 barrels or two years' normal output of the largest cement plant in the world, four times the amount used in any dam heretofore constructed, will be used. It will take a year for the excavation and three to pour the concrete. This will necessitate a $2,000,000 plant and the employment of 1500 men. Five years will be the time limit on the contract.

"CLEAN UP; PAINT UP"

The California Highway Commission is sending out notification to cities and private corporations maintaining poles, that they comply with new marking regulations. The rule is that all new poles on state highway rights of way must be painted white from the ground to points six feet high. The regulation may also be complied with by the tacking of 1" x 3" white painted strips to a height of five feet to that portion of the pole visible to the passing traveler.

ROMANCE OF TRANSPORTATION IN CALIFORNIA

(Continued from page 6.)

accomplished last year by oil instead of water as in by-gone days and will be more effectively accomplished next year. I have had occasion recently to go through an old biennial report of the Department of Engineering and have been interested in the comments of the commissioner. His insistent pleas for increased appropriations to enable him to make improvements commensurate with the requirements of a rapidly increasing traffic sounded very much like the arguments used today to secure appropriations for the same purpose. Thus after a period of 31 years as a state road its stage of improvement is like that of many highways in the state system, still trailing behind the traffic requirements with little immediate prospect of catching up. Nevertheless, each year brings its marked improvement. Only three years ago with the beginning of the winter rains maintenance forces were withdrawn to Camino and no attempt made to keep the road in condition beyond. In the winter of 1924-25 such blading and dragging as was possible was done between Camino and Riverton and in the winter of 1925-26 the road was kept open to Riverton.

This year a surfaced road is available through country where heretofore slippery clay has been a menace to traffic if not actually rendering the road impassable with every rain. Traffic can now reach the snow line all through the winter. The day is fast approaching when some trans-Sierra road will be kept open throughout the winter as was the Placerville road in the days when traffic required it.

As we look back over the history of this road and the service it is now rendering, and its prospects for the future, we can but say with Charles Fee, the poet of Stockton: "The road—upon its way has trod the feet of those who made its life, who blazed the trail o'er mountain pass, by lonely hill, down to the ports of men. Upon its path has walked the past with memories divine. Dust covered, dim, the wraiths of years down all its pathways shine."

Over one million six hundred thousand motor vehicles are using the California highways this year.

BLAST TO OPEN INYO-MONO SNOW PACK

FIGHTING THE SNOW IN INYO AND MONO—(1) South slope of Deadman after the April storms. (2) And 10 miles from camp. (3) After blasting followed by tractors and road graders—Nature completes the job—Deadman Summit. (4) After blasting followed by tractor and grader—South side Deadman.

By F. G. Somner, Division Engineer, Division IX.

DIVISION IX has been busily engaged fulfilling the promise given to the public and resort owners two months ago to have Route 23, Bishop, Inyo County, to the north boundary of Mono County, cleared of snow by the opening of the fishing season, May 1st.

Inasmuch as Route 23 crosses the Deadman Summit at an elevation of 8047 and the Conway Summit at 8155 the task was not an easy one. The snow fall was the heaviest since 1915 and the thermometer registered from 10 degrees to 25 degrees below zero during the winter months within the zone of the heavy snow fall, resulting in packed and frozen drifts. Cold weather and snow storms prevailed during April and menaced for a time the completion of the operations by the date set.

No snow plows were available and systematic assistance to nature well in advance of the actual removal operations was the only recourse, which was accomplished by means of sanding, blasting, and plowing followed by tractors, graders, teams and fresno scrapers. The work was conducted on either side of the Deadman Summit by Maintenance Foremen Paul Peak and Ray Flynn and on the Conway Summit by Will D. Miller.

Ode to the Horse.

O horse, you are a wonderful thing;
No buttons to push, no clutch to slip,
No sparks to miss, no gears to strip,
No license-buying every year.
No plates to screw on front and rear,
No gas bill climbing up each day,
Stealing the joy of life away.
No speed cop chugging in your rear,
Yelling summons in your ear.

Your inner tubes are all O. K.
And, thank the Lord, they stay that way.
Your spark plugs never miss and fuss.
Your motor never makes us cuss.
Your frame is good for many a mile,
Your body never changes style.
Your wants are few and easy met,
You've something on the flivver yet.

—*Gouvernelt (N. Y.) Free Press.*

IF.

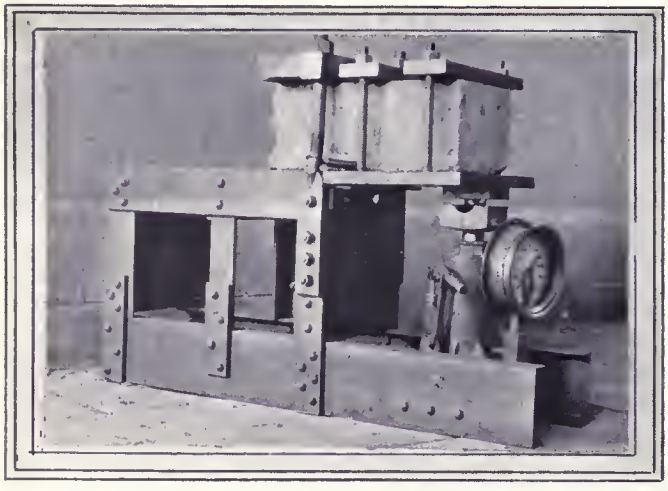
By George Bancroft Duren.

(*With the usual apologies to Kipling.*)

If you can climb a hill when all about you
The cars are coughing like a kid with croup;
If you can hit a mud road deep with puddles
And sail across it like an ocean sloop,
Or wear a treadless tire and not grow weary
And blow it out in some deserted place,
Or hit upon six cylinders entirely
When hail and snow and rain beat on your face;
If you can make a mile in sixty seconds,
And yet not make the love for speed your aim;
Then throttle down to half a mile an hour
And never stall to smirch my name with shame;
If you can last five years and not resemble
A pile of junk upon some ashman's heap;
If you can suffer lack of fuel and water
And still ride on without a single peep;
If you can promise me you have these virtues
And with them all you cost a modest fee,
Yours is this chugging world and all that's in it—
And what is more, you are the car for ME.

—*Georgia Highways.*

Concrete Testing Machine Designed By Highway Engineers



First hydraulic beam testing machine made by California Highway Commission. Load applied vertically through ball over jack.

Improved beam testing machine now adopted as a standard. (Beam shown has just been broken over support.)

C. S. Pope, Construction Engineer, and C. L. McKesson, Materials and Research Engineer of the California Highway Commission, are the designers of a concrete beam-testing machine which will in future speed up the opening of concrete roads to traffic.

The method of testing concrete by means of beams in order to determine the proper time of opening has been in use in a number of eastern states for several months, but the machines ordinarily in use in other states have usually been rather crudely designed and lacked portability. The machines in use by the California Highway Commission weigh about 250 pounds and may be readily transported from place to place.

In the construction of concrete pavements, it has been the practice in California to require a curing period of 21 days. During the first 8 days the concrete is covered with earth and kept watered to insure proper hardening.

The Pope-McKesson machine has been devised for the purpose of testing concrete beams cast during the paving operations at proper intervals of time. These beams are cured under the same conditions as the concrete going into the pavement and are broken at intervals of usually 7, 10 and 14 days to determine whether or not the concrete has reached a strength sufficient to make it safe for opening to traffic.

The concrete beams are moulded to a cross section area of 7 inches by 10 inches and are 3 feet in length. After the proper period of curing, a beam is clamped in the machine with about 12 inches projecting and subjected to the strain of a hydraulic jack until the beam breaks. The breaking strength is registered on a dial and from it, the modulus of rupture of the beam is determined by use of the proper formula.

At the present time, the requirements of the Construction Department are that the modulus of rupture shall be not less than 400 pounds per square inch.

Since this method of testing is more or less in an experimental stage, parallel samples of concrete cylinders cast at the same time that each beam is manufactured are made and these are shipped to the Testing and Research Laboratory at Sacramento for test at the same time as the beams are tested. Heretofore, all testing has been done at the Sacramento laboratory which necessitated the shipping of samples from all parts of the state to Sacramento.

With the accumulation of data which is expected from the present tests, the necessity of shipping so many specimens to the Sacramento laboratory may be avoided. Time lost in waiting for shipments to be received, tests completed and reports returned, will be largely saved. As a consequence, the time of closing the highways due to curing of concrete can be decreased with a consequent great advantage to the traveling public.

HIGHWAY NEWS NOTES.

According to the St. Helena Star the city trustees of St. Helena are using the State Highway Commission method of applying oil under pressure for the purpose of laying dust and saving the road surface.

The Fall River Mills Tidings of May 6th says: The highway maintenance crew, under Wm. Lunsford, has been doing some excellent work on the road between Big Valley Mountains and Fall River Mills, which has put the road in good condition.

Proper Training.

Football Coach (to applicant for place on team)—"What experience have you had?"

Applicant—"Well, last summer I was hit by two autos and a truck."—Boston Transcript.

America's First Macadam.

The first great highway in the country was opened in 1818. It ran from Cumberland, Maryland, to Wheeling, West Virginia, and was 40 feet wide so that "fast mail coaches at 10 miles an hour went by the slow wagons without interference." This highway was constructed of macadam, invented by the Scotch Engineer, John Loudon MacAdam, who was on its engineering staff. This road was later extended through the capitals of Ohio, Indiana and Illinois, to St. Louis. It was not paved for this entire distance, but was graded, and the wider the tires on vehicles traveling over it, the less the toll tax.—Weston's Record

In Los Angeles.

Keep walking to keep well, the doctors advise. To be sure; and occasionally jump.

DIVISION FLOWERS GRACE NEW HEADQUARTERS OPENING

A distinctive feature of the formal opening of the new Division VIII headquarters at San Bernardino was its decoration with many and varied wild flowers from all parts of the division, as related by the San Bernardino Sun.

The Mojave desert around Barstow contributed banks of yellow daisies, sunshine flowers and deep orange California poppies. From the sandy wastes of the Imperial Valley came

VISITORS ALWAYS WELCOMED—A small part of the crowd that inspected the new Division VIII headquarters at San Bernardino on April 30th.

the rich purple desert lilies whose appearance suggested they had been carefully reared in a hothouse. And there were many more: the blue larkspur from Victorville, the desert aster from Dagget and wallflowers and blue canterbury bells from the Waterman Canyon. J. E. Stanton who is an enthusiast upon desert flowers, as well as a very efficient maintenance engineer arranged the decorations.

Division Engineer E. Q. Sullivan estimated that at least 3500 people inspected the new buildings.

Boston's Traffic Jam.

Motor Cop (to professor of mathematics)—"So you saw the accident, sir. What was the number of the car that knocked this man down?"

Professor—"I'm afraid I've forgotten it. But I remember noticing that if it were multiplied by fifty, the cube root of the product would be equal to the sum of the digits reversed."—Boston Transcript.

Hit and Run.

Friend—"I suppose you didn't run across a fellow named Scrimshaw on your travels."

Road Hog—"Dunno, old man—I never stop to ask their names!"—Passing Show.

Fellow Flayers.

Son—"What is a taxidermist?"
Father—"He skins animals."
Son—"Well, what is a taxi-driver?"
Father—"He skins humans."—Cornell Widow.

Where Desire is Drowsy.

Nothing works out right. In a town where you can park as long as you want to there is no reason why you should want to—Birmingham News.

Irish Efficiency.

"You say a clay pipe is a great time saver. How is that?"

"Faith, an' whin ye drop it ye don't have to bother pickin' it up."

SLOW TRUCK TRAFFIC ON NARROW HIGHWAYS COSTLY TO THE MOTORING PUBLIC

Reported by E. T. Scott, Assistant Maintenance Engineer, Division VII.

THE TWO-LANE highways carrying a heavy mixed traffic of automobiles and slow moving trucks are not economical from the standpoint of the auto driver.

To the individual motorist who has to check his driving speed when he overtakes a heavy, slow moving truck, to watch for a clear road ahead, or to let a car pass that approaches from the opposite direction, before he can pull ahead of the truck, the inconvenience and loss of time is but slight. However, this very small inconvenience that one slow moving truck causes one motorist, once in a while, becomes a considerable inconvenience when several thousand autos attempt to pass several hundred slow moving trucks on the two-lane highways.

Observations for this report were made on a stretch of highway in Los Angeles County, 9.5 miles in length, from traffic counts and observations extending over a period of two years, with the idea of determining if the loss in time and inconvenience would justify a higher maintenance cost in widening highways and eliminating obstructions.

It was found that the average speed of cars was 26 miles per hour and that of the trucks to be passed, 8 miles per hour. Time lost by each auto in waiting for an opportunity to pass a truck averaged 11 seconds. It was determined that there was an average of 1,227 "passings" per hour, which, multiplied by 11 seconds and reduced to hours, showed a loss of 3.75 hours to the autoists each hour, or 60 hours in the traffic count day of 16 hours.

Assuming that there are two persons in each auto and the value of their time is 25 cents per hour and allowing 50 cents per hour for auto rental the loss to the motorists is $60 per day or $21,900 per year in the use of the 9.5 miles of highway on which the observations were made.

HIGHWAY PER CAPITA INVESTMENT.

Every man, woman and child in Nevada has an investment of $130 in the highways of the state, according to figures recently compiled by the Nevada State Highway Department.

With the same per capita in California the Gold State ought to have $600,000,000 invested in state highways. The real figures show but one-fourth that amount, however, putting the per capita for California at $33.

Extravagance.

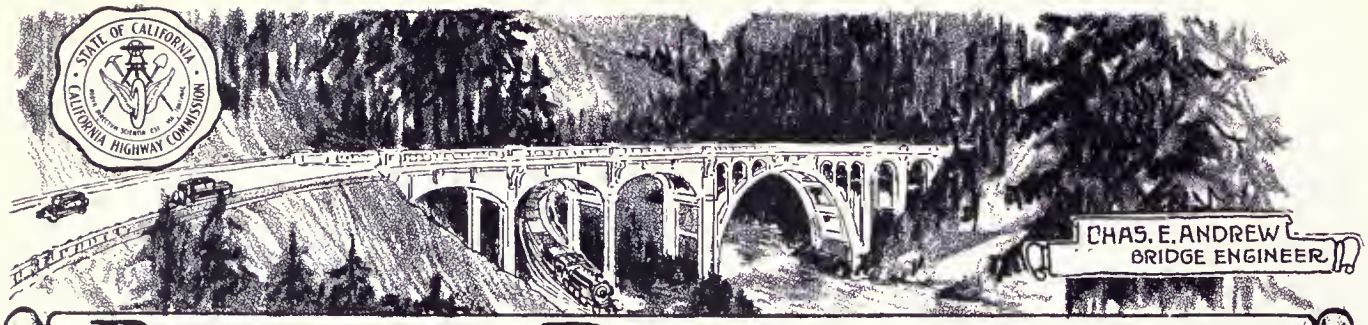
Ike: "Look, pap, Abe's cold is gone, and ve still got left a box of cough drops."

Father: "Oh, vat extravagance; tell Herman to go and get his feet wet."—Florida Highways.

When Noah sailed the waters blue
He had his troubles, same as you.
For forty days he drove the Ark
Before he found a place to park—Exchange.

FORTUNES OF THE BALL TEAM.

Manager Marion McGriff of the central office ball team is having his troubles. He started the Twilight League season with a 11-2 win over the Rauels who have protested his pitching of Montijo, a supposed ringer. On the 23d he pitted his road men against the Divine Grocery, being shut out 11 to 0.



BRIDGE DEPARTMENT

CHARLES E. ANDREW, NEW STATE BRIDGE ENGINEER

CHARLES E. ANDREW, who has been bridge engineer for the highway commission of the state of Washington since 1920, has been appointed bridge engineer in the California Highway organization.

Mr. Andrew qualified on the civil service list as a result of examination held this spring and his appointment is effective May 1st. He fills the position formerly held by Harlan D. Miller, who died in October, 1926.

Mr. Andrew has had wide experience as a bridge engineer in the states of Oregon and Washington. He is a graduate of the University of Illinois, and for some time was in the employ of Ralph Modjeski, nationally known bridge engineer, in whose service he came to Oregon in 1906.

His work in the northwest has included the building of many notable structures in the Puget Sound territory and elsewhere in Oregon and Washington. Mr. Andrew is widely and favorably known as a bridge engineer throughout the west. The California Highway Department is fortunate in securing his services.

Eaton Canyon Wash Bridge.

A reinforced concrete bridge 160 feet long with 40-foot roadway and two 6-foot sidewalks has been built recently under the direction of Guy Mapes to replace an old structure across Eaton Canyon Wash at the city limits of Pasadena (VII-L.A.-9-E). The city of Pasadena surfaced the approaches. The flood waters of February 15th washed out the detour across the wash and in order to accommodate traffic the bridge was opened before all work was finished.

Bridge Moved Without Suspension of Traffic.

An interesting feature in the construction of a bridge-widening job recently completed in Southern California was the moving of the old structure under traffic. This is the four-steel span bridge over the Rio Hondo in Los Angeles County, route 2-D, between Los Angeles and Whittier. The original bridge built in 1921 provided a 24-foot roadway now inadequate for traffic. It was decided to build a duplicate structure parallel to the old and in order to make the completed crossing symmetrical about the center line, the old portion was moved 15 feet. This work was accomplished without the inconvenience and expense of a detour and without delay to the contractor. The completed bridge now provides a total roadway width of 48 feet which will be sufficient to carry the traffic for some time. A. S. Kennedy, resident engineer, had charge of the work.

New San Ardo Structures.

Three more narrow, obsolete and antiquated stream crossings have been eliminated from the Coast highway in Monterey County by the construction of modern structures near San Ardo about twenty miles south of King City. The two major crossings are 250-foot reinforced concrete trestles and the third a concrete box culvert under a fill on a line change. The two new bridges cross deep arroyos with the grade line in each being about 60 feet above the stream bed. At the location of the culvert the road was built on a new alignment which replaced four sharp curves with one of 1500-foot radius.

The line change at the new culvert involved the grading and surfacing of about 2100 feet of paved roadway, an experiment being made in the use of Laykold or emulsified asphalt as a binder material. The results appear to be very satisfactory.

The problem of preventing damage to the footings by erosion of the stream beds was solved by the construction of a cement rubble overflow dam about 75 feet downstream from both of the bridges. The crests of these dams were built at about the elevation of the ground at the bridge, which will result in the flow of the stream being checked with the tendency to silt up rather than scour. George J. Porter was resident engineer. The total cost of the work was approximately $85,000.

La Placerita Creek Bridge.

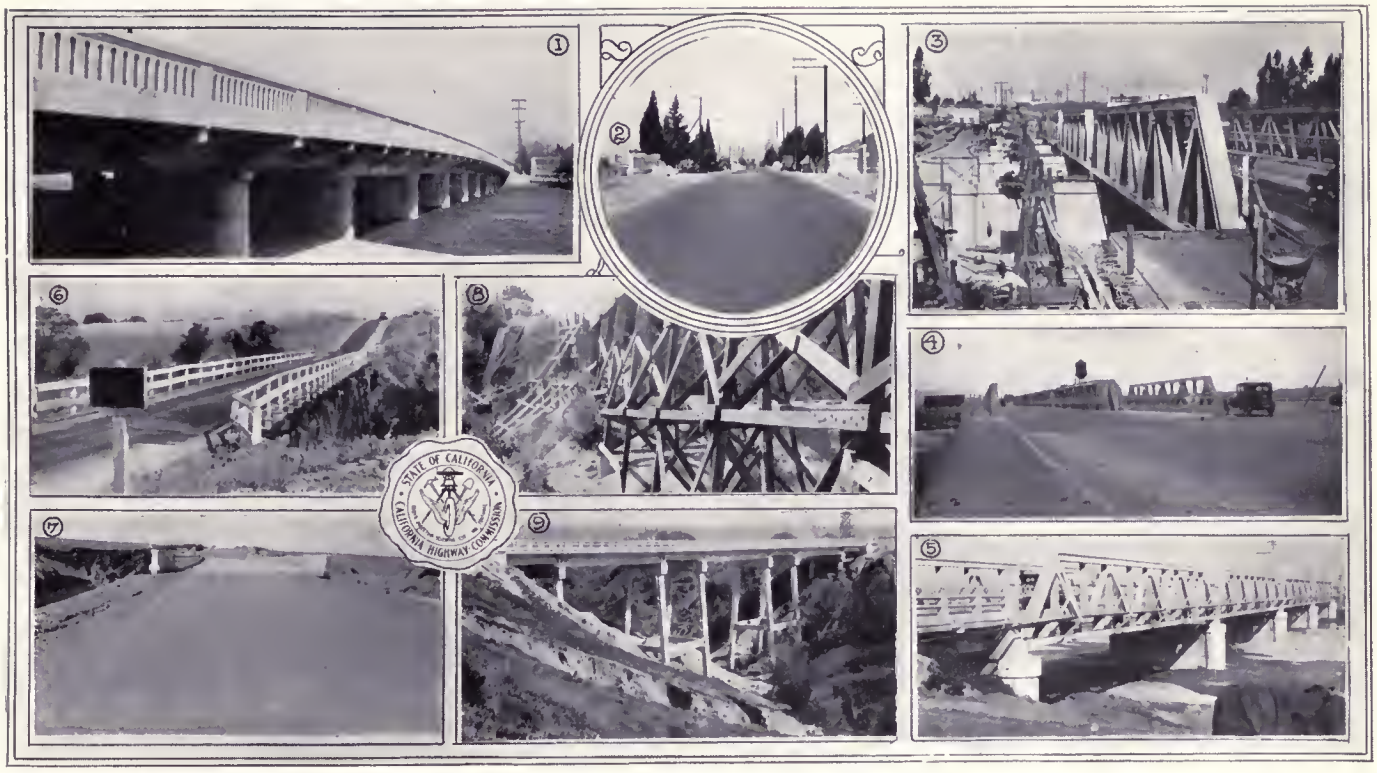
Cutting the time between the pouring and driving of concrete piles from 28 days to a minimum of one day was the result obtained in the construction of the two La Placerita Creek bridges (VII-L.A.-4-E) by the use of Lumnite cement. These bridges are 18-foot skewed deck slabs on reinforced concrete pile bents. The bridge across the main channel consists of six spans while the smaller bridge is but 18 feet in length. The curb and rail conform to the highway standards and both bridges have a 30-foot roadway and 4-foot sidewalk.

Santa Ana River Bridge.

Another bridge to be opened to traffic within the last few weeks is a 564-foot concrete structure crossing the Santa Ana River between Santa Ana and Anaheim (VII-Ora.-2-D). It consists of five 54-foot spans and eight 37-foot spans with a 40-foot roadway and two 6-foot sidewalks. The piers and abutments of the old bridge were extended to carry the new structure. This contract also included grading and paving the approaches and protecting the approach fills with concrete slope paving. George Thompson and A. L. Richardson were the resident engineers. The state received Federal aid on this project, total cost of which was nearly $110,000.

Storm Damaged Trestle Replaced.

Over 200 feet of the San Dieguito slough trestle bridge (VII-S.D.-2-A) have been rebuilt, following storm damage, under the direction of M. E. Whitney, resident engineer.



MODERN STRUCTURES SUPPLANTING OUT-OF-DATE- BRIDGES—(1) Fine new structure just completed across Santa Ana River, between Santa Ana and Anaheim. (2) La Placerita Creek bridge, Los Angeles County, showing width of roadway to take care of future travel. (3) Same bridge being moved without stopping traffic, and (4) widened and completed for two-way travel. (5) Old Rio Hondo River bridge between Los Angeles and Whittier. (6) and (7) Views of same structure showing comparative roadway width and site view. (8) and (9) Before and after views of trestle beneath San Ardo structure in Monterey County.

AN EPITAPH ON BAD ROADS.

They took a little gravel,
And took a little tar,
With various ingredients
Imported from afar;
They hammered it and rolled it,
And when they went away
They said they had a good street
To last for many a day.

They came with picks and smote it,
To lay a water main,
And then they called the workmen
To put it back again.
To lay a railway cable
They took it up once more,
And then they put it back again
Just where it was before.

They took it up for conduits,
To run the telephone,
And then they put it back again
As hard as any stone.
They tore it up for wires
To feed the 'lectric lights;
And then they put it back again,
And were within their rights.

Oh, the street's full of furrows,
There are patches everywhere;
You'd like to ride upon it,
But it's seldom that you dare.
It's a very handsome street,
A credit to the town;
They're always digging of it up
Or putting of it down.

—*Washington Post.*

THE CARQUINEZ BRIDGE

REGARDLESS of the fact that the Carquinez Bridge, built by the American Toll Bridge Company and opened to the public on May 21st, is a private enterprise, the California State Highway Commission is taking more than a passing interest in it owing to the fact that the Pacific Highway and many other state road routes will direct traffic to the new bridge. The amount of traffic the bridge is called upon to accommodate will have a direct bearing on future state highway construction in that region.

The new bridge is the largest highway bridge in the world and provides a continuous overland highway from Canada to Mexico and unites Northern California and portions of Central California with the bay district metropolitan area. It bridges Carquinez Straits from Vallejo, Solano County, to Crockett, Contra Costa County.

Hidden in the cold figures of the giant span are some unusual facts. It is 4482 feet long, of cantilever type, with four cantilever arms and two suspended spans. The two cantilever spans, including the suspended spans are 1100 feet long. More than 45,000 cubic yards of concrete and 12,600 tons of steel were used. It is 135 feet from the water and 460 feet from bedrock. Ten of the largest anchors ever used west of the Rockies, each weighing 8½ tons, hold the structure. Two miles of two-inch chains were used to sink the caissons.

ROAD ITEMS

According to reports of the Department of Agriculture, there are 560,000 miles of surfaced highways in the United States.

Mexico has a federal road system under construction comprising 1337 miles of highway, on which $6,000,000 is being spent annually.

The state road budget for Illinois for 1927 is $70,000,000.

WHAT THE DIVISIONS ARE DOING

DIVISION III.

HEADQUARTERS, SACRAMENTO.

F. W. HASELWOOD, DIVISION ENGINEER.

Counties of Butte, Colusa, El Dorado, Glenn, Nevada, Placer, southern Plumas, Sierra, Sutter, Yuba, and northern Sacramento and Yolo.

Work Started at Tahoe.

After delay on account of the late season, both maintenance and reconstruction crews are now busy at Lake Tahoe. It is expected that the grading and rock surfacing will be completed this season between Tahoe City and Meeks Bay. A contract was recently awarded to Hemstreet and Bell of Marysville for 20,000 cubic yards of rock surfacing on this road. Near Emerald Bay the gas shovel has been put to work and will operate on double shift most of the season.

Truckee River Highway Work.

Improvement of the Truckee River highway between Truckee and Verdi is in progress. Nevada is paving with Portland cement concrete the four miles between Verdi and the California state line and the 19 miles from Truckee to the state line in California is being oiled. Work on this road both in Nevada and California will be completed in time to serve travel to and from the Highway Exposition in Reno, which opens June 25th. Hemstreet and Bell made excellent progress on this road crushing and spreading 10,500 cubic yards of rock in 41 days from March 17th, to May 5th, averaging 256 cubic yards per day.

Work on Tahoe-Ukiah.

A. Haidlen Company recently completed their contract for grading from Nevada City to Harmony ridge, a portion of the Tahoe-Ukiah route. The new grade, while only 16 feet wide and subject to further improvement, eliminates the steep grade on the present county road.

Four Oil Outfits Busy.

Application of oil to graveled roads is proceeding rapidly throughout the division. Four oil-distributing outfits are at work continuously. Oil is being applied as a dust layer, as a seal or by mixing, according to the condition of the road.

Personal Notes.

J. L. Piper, who has been with the Commission for fifteen years, has asked for a leave of absence on account of ill health. Mr. Piper will be missed in the division and our best wishes for a speedy recovery are extended to him.

E. J. L. Peterson, formerly employed as draftsman, has been in charge of the grading on Nev-15-C between Nevada City and Harmony ridge. He is now assisting in the oil mixing operations beyond Truckee.

Ed Willis returned to his old haunts at Tahoe City early in May. He had to plow off several feet of snow to find a road to work on.

Federal Work Near Tahoe.

The Isbell Construction Company has resumed work surfacing the road between Truckee and Tahoe City. This road is being built under the supervision of the Bureau of Public Roads from Forest Highway funds. Negotiations are in progress for the construction of a subway under the Southern Pacific near Truckee and an overhead crossing of the same railroad combined with a crossing of the Truckee River about five miles north of Tahoe City.

On the Placerville-Lake Tahoe road, the Bureau of Public Roads recently awarded to Irey and Holden a contract for completing the grading and rock surfacing, between Pacific House and Riverton. Work is under way.

DIVISION VI.

HEADQUARTERS, FRESNO.

E. E. WALLACE, ACTING DIVISION ENGINEER.

Counties of Fresno, Madera, Merced, Mariposa, Kings, Tulare, and Kern, north of the Tehachapi.

Improving All-Year Highway.

DIVISION VI is concentrating its energies on getting the Yosemite All-Year road widened and oiled for the summer traffic. Oiling by the mixing method is progressing at the rate of a mile a day. Rock surfacing is practically complete and a heavy grading outfit is widening the roadway and eliminating the worst curves. By the first of July, a wide, smooth, oiled road will connect the pavement at Planada with that at El Portal.

Opening Canyon Road.

A crew of men are opening the road to Hume in the Kings River Canyon. Due to exceptionally heavy rain and snowfalls, this road is blocked by slides and fallen trees and it is estimated that it will take a week's work to open a trail.

Sequoia Park Road Ready.

It is planned to oil the unpaved section of Route 10 from Three Rivers to the Sequoia Park boundary, to connect with the oiling work being done by Colonel John R. White, Superintendent of the Park. Curves on this road have been widened with oil or waterbound macadam and the road is in good shape for the summer traffic.

Working On Valley Route.

Rapid progress is being made by crew under Thomas Eastman widening the roadway, filling borrow pits and eliminating irrigation ditches inside the right of way, on the main Valley road south of Fresno.

DIVISION VII.

HEADQUARTERS, LOS ANGELES.

S. V. CORTELYOU, DIVISION ENGINEER.

Counties of Los Angeles, Ventura, Orange, San Diego, and eastern Kern, south of Mojave.

56-Foot Highway in Orange County.

ALL WORK has been completed on the reconstruction of the highway in Orange County, from the easterly limits of Santa Ana to Tustin. The new highway is paved with concrete 56 feet wide between curbs. The cost of half the reconstruction work was paid for by an Orange County Improvement District. Griffith Company were the contractors and J. B. Hodges, Resident Engineer, supervised construction. Orange County furnished part of the field inspection and gave excellent cooperation in every way in carrying on this work.

Mountain Springs Grade Work.

The Mountain Springs Grade job is progressing rapidly. Grading operations are in progress, improving the alignment, on a quarter-mile stretch at the lower end of the grade, but from this point up the grade to Mountain Springs, a distance of 5 miles, the 20-foot concrete pavement has been completed and opened to traffic. Between Mountain Springs and Boulder Park at the top of the grade pavement has been completed half width, 10 feet, and opened to traffic. One-way controls regulate travel.

Reconstruction in San Diego County.

Work has been started on the reconstruction and widening of the state highway in San Diego County between La Mesa and El Cajon. The new pavement will be of concrete 20 feet wide, with 2-foot crushed rock shoulders. C. P. Montgomery, resident engineer, who recently completed his work on the Malibu grading and paving job in Los Angeles County, on the Oxnard-Capistrano highway, has been assigned to this contract.

News Notes.

Concrete pavement and curbs are now being placed through the town of Laguna, on the Oxnard-Capistrano highway in Orange County.

R. L. Thomas, resident engineer, has been assigned to special reconnaissance work and A. D. Griffin has taken Mr. Thomas' place as resident engineer on the Laguna job.

DIVISION IX.

HEADQUARTERS, BISHOP.

F. G. SOMNER, DIVISION ENGINEER.

Counties of Inyo, Mono, and eastern Kern County, north of Mojave.

ON THE Mojave Desert the construction of paved dips is in progress to provide for the flows from the Los Angeles city aqueduct and to carry storm waters at other points.

A contract has been awarded to Harry Wilson of Lone Pine for the surfacing with screened decomposed granite five miles south from Independence.

Alignment improvements and surfacing six miles with decomposed granite south from Big Pine is well under way.

Surveys have been completed for relocation of a distance of 50 miles from Lone Pine to Little Lake, with preparations of plans and estimates under way.

Division IX has been visited recently by T. H. Dennis, Acting Maintenance Engineer, and F. L. Richardson, Assistant Equipment Engineer.

DIVISION X.

HEADQUARTERS, SACRAMENTO.

R. E. PIERCE, ACTING DIVISION ENGINEER.

Counties of Amador, Calaveras, Alpine, Tuolumne, Stanislaus, San Joaquin, Solano, and southern Sacramento and Yolo counties.

Mossdale Bridge Approaches.

THE SAND fill on the Mossdale bridge approaches is progressing slowly on account of difficulties in getting the plant in operation and delay in the bridge construction work.

The west approach is completed and work is progressing on the east approach.

Oiling Program.

The oil surface treatment program in Division X commenced on the first of May with two major crews: one in Amador County between Ione and Jackson under foreman H. S. Clark, and the other in Calaveras County between Valley Springs and San Andreas, under foreman W. H. Martin.

Contract No. DM-238.

Under recent informal contract, A. Teichert & Son, Inc., have completed approximately 900 feet of asphaltic concrete pavement north of Turlock over new right of way, connecting the state highway with the city limits at North Center street.

Contract No. DM-248.

In Solano County on Route 7 between Putah Creek and Dixon, the roadway has been widened under informal contract No. DM-248, awarded to L. D. Moore. Crushed rock borders, 2 feet wide, were placed by state forces. This road on account of the narrow shoulders, composed chiefly of adobe soil, has been dangerous especially during wet weather; this widening should make a safer road.

Personal Items.

L. D. Kelsey, employed as instrumentman with Division X, is now working for the city of Berkeley on valuation work.

Van G. Horton, formerly employed with the highway commission, is working on survey with this division.

HIGHWAY NEWS NOTES

Thornton K. May, who has been temporarily employed with the Montana Highway Commission, has returned to the Bridge Department.

Walter Wesch, a former employee of the Bridge Department, recently returned from Montana where he was employed as engineer in charge of bridge design for the Montana Highway Commission.

George J. Ulrich of Modesto has been awarded the contract for the construction of Pacheco Creek Bridge, road V-S.Bt.-22-B. H. E. Fearnall, resident engineer, who has been assisting A. S. Kennedy, at Klamath River Bridge, will have charge of the work.

W. A. Douglass, recently resident engineer on timber bridge construction in Imperial County, has been assigned to the office for work in the Construction Department.

J. C. Wilson has completed on his work the contract for widening the four bridges across Vejor, West Vejor, Conejo and Las Virginas Creek in Los Angeles and Ventura counties, and is now enjoying a short vacation.

Stanley Kimball, Assistant Resident Engineer, has been assigned to work on the Klamath River Bridge.

We are late in going to press with the report of the prowess of Henry E. Kuphal, whose rare accomplishment in leading the rabble in the golf tournament at the Arcade Course has already been broadcasted in our leading periodicals.

The Western Construction News of San Francisco in its issue of April 25th reproduced our article and drawings, explaining graphic charts and their use in bridge design by Harvey D. Stover, office engineer in the Bridge Department, Sacramento. More articles of this nature are desired by California Highways.

REDLANDS NEWSPAPER MAN PAYS TRIBUTE TO ENGINEER

Lyman M. King, editor of the Redlands Daily Facts and a prominent figure in state affairs, writes the following to E. Q. Sullivan, Division Engineer of Division VIII:

> "Up in Redlands we have appreciated very much the fine attention you have given to the roads in this part of your division. Certainly if all the divisions are as well handled, and with as much attention to the desires of the people, the state is well served."

FROM AFRICA AND CHINA.

THE fame of California has traveled far, but it appears that construction and maintenance practices followed by the State Highway Department are attracting equal attention in distant lands. On the same day, recently, the BULLETIN received two clippings, one from *The Standard*, published in Nairobi, British East Africa, and the other from the Shanghai *Mercury*, of Shanghai, China, both quoting the State Highway Engineer of California.

The Nairobi paper republished, in full, a long article telling of the oiling of California highways to eliminate dust and reduce maintenance costs. The item in the Shanghai paper was a discussion of standards of construction.

A GREAT deal of the joy of life consists in doing perfectly, or at least to the best of one's ability, everything which he attempts to do.

There is a sense of satisfaction, a pride in surveying such a work—a work which is rounded, full, exact, complete in all its parts—which the superficial man, who leaves his work in a slovenly, half-finished condition, can never know.

It is this conscientious completeness which turns work into art, the smallest thing, well done, becomes artistic.—William Mathews.

STATE HIGHWAY FUND CONTRACTS (Bond Funds, Including Federal Aid)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE APRIL 13, 1927.						
513	VII	Ventura	60	A	Between Oxnard and Hueneme Road	4.99	Grading and P.C.C. Pavement	United Conc. Pipe and Const. Co.	$174,319 88	July 31, 1926	------
					AWARDED SINCE APRIL 13, 1927.						
522	V	San Benito	22	B	Across Pacheco Creek	------	R.C. Girder Bridge	George J. Ulrich	$27,801 56	May 11, 1927	150
523	I	Humboldt	1	K	Between Orick and Section 36—T.12N.,R.1E.	8.15	Grading and Rock Surfacing	W. H. Hauser	229,469 70	May 11, 1927	150
524	I	Humboldt	1	K	Between Sec. 36—T.12N.,R.1E. and the northerly boundary	6.77	Grading and Rock Surfacing	Engelhart Paving and Const. Co.	280,955 24	May 11, 1927	175
					Total State Highway Fund Contracts Awarded	14.92			$538,226 50		

NOTE.—Primary construction covered by the above contracts does not include funds obligated on cooperative forest highway projects, prison camp road activities, or day labor jobs not being done under contract.

STATE HIGHWAY MAINTENANCE FUND CONTRACTS (Including Gasoline Tax Fund)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE APRIL 13, 1927.						
M-119	X	Stanislaus	4-13	B-A	Between Modesto and Stanislaus River and between Salida and McHenry Road	12.67	P.C.C. Widening and A.C. Surface	Valley Paving and Const. Co.	$263,489 17	April 23, 1926	------
M-125	V	Monterey	2	H	Between San Ardo and Bradley	------	One Culvert and Two Bridges	Granite Construction Co.	95,492 81	May 7, 1926	------
M-130	VII	Orange	2	D	Across Santa Ana River 2 miles north of Santa Ana	------	R.C. Girder Bridge	Charles and F. W. Steffgen	116,859 49	June 8, 1926	------
M-133	VIII	Riverside	26	E-F	Between Indio and 6 miles south of Coachella	8.99	P.C.C. Widening and A.C. Surface	Southwest Paving Co.	210,104 68	July 14, 1926	------
M-138	V	Monterey	2	D	Across Salinas River, 1 mile south of Soledad	------	Refloor and Paint Steel Bridge	Atlas Const. Co.	47,319 63	Aug. 28, 1926	------
M-147	VII	Orange	2	C	Through Tustin	1.51	Grading and P.C.C. Pavement	Griffith Co.	72,021 97	Sept. 28, 1926	------
					AWARDED SINCE APRIL 13, 1927.						
M-168	IV	Alameda	5	B	Between Livermore and Dublin	8.90	Portland Cement Concrete Pavement	N. M. Ball	$361,635 30	May 11, 1927	125
					Total State Highway Maintenance Fund Contracts Awarded	8.90			$361,635 30		

NOTE.—The above obligations charged against the State Highway Maintenance Funds do not include funds from these sources obligated for general maintenance and for specific betterments being done under day labor authorization.

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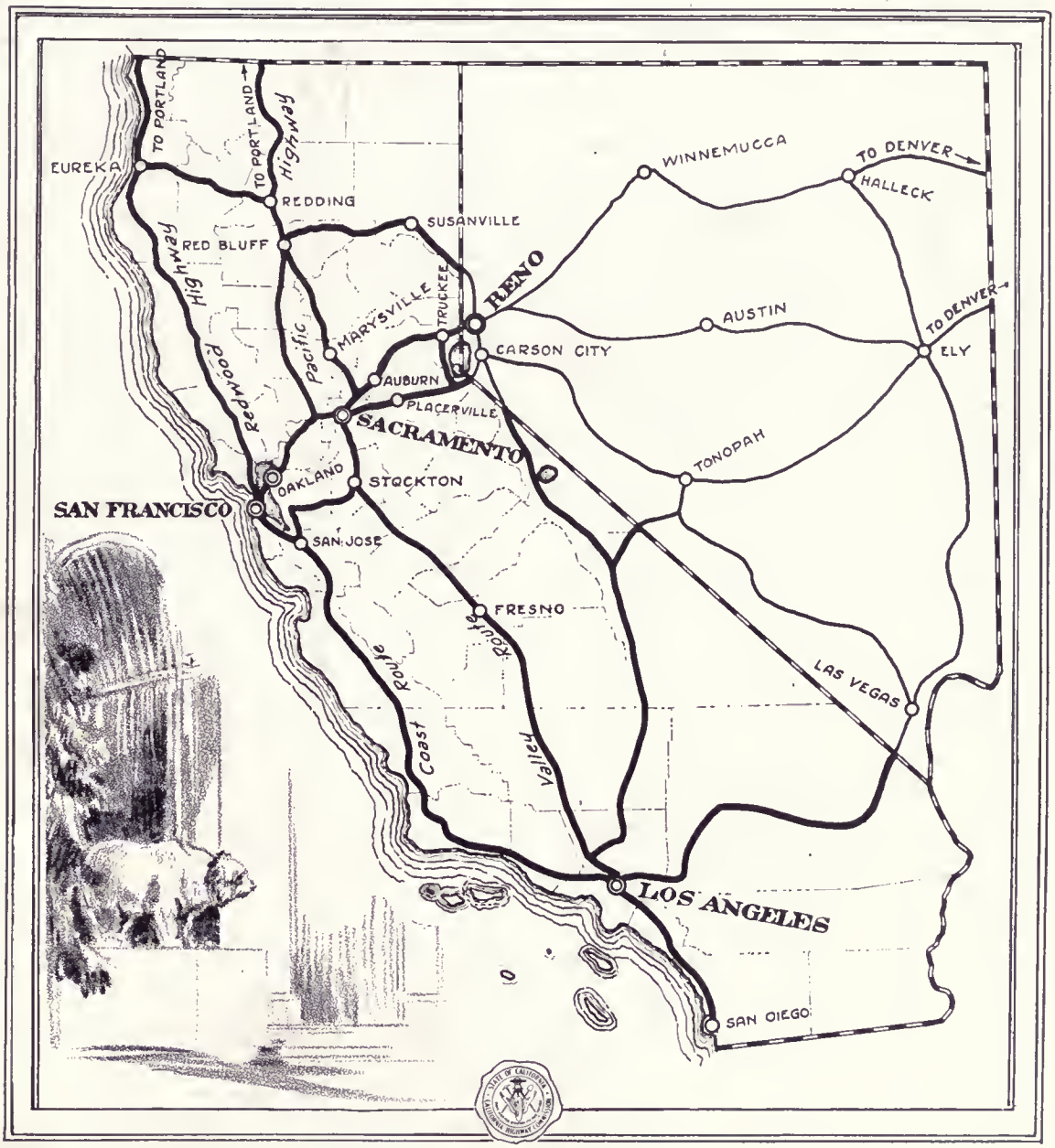
CALIFORNIA HIGHWAYS

A BULLETIN ISSUED BY THE CALIFORNIA HIGHWAY COMMISSION FOR THE INFORMATION OF ITS EMPLOYEES AND THE PUBLIC

Vol. 4 JUNE, 1927 No. 6



ON TO THE GOLDEN STATE—Map showing the principal routes of California's state highway system and centers of population. California Invites You!

In this issue: CALIFORNIA'S HIGHWAYS INVITE EXPOSITION VISITORS.

For Routes and Description see Page 5.

CALIFORNIA HIGHWAYS

This Bulletin is published by the California Highway Commission for the information of its employees and the public. Editors of newspapers and others interested are welcome to use, without restriction, any of the matter herein contained. Cuts will be gladly loaned upon request.

J. P. HALL - - - - Editor
P. O. Box 1103, Sacramento, California.

Vol. 4. JUNE, 1927. No. 6

CALIFORNIA HIGHWAY DEPARTMENT

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M. B. HARRIS, Commissioner, Fresno

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S. V. CORTELYOU, Division VII, Los Angeles
E. Q. SULLIVAN, Division VIII, San Bernardino
F. G. SOMNER, Division IX, Bishop
R. E. PIERCE (Acting), Division X, Sacramento

General Headquarters, Third Floor, Strub Bldg., Eleventh and P Streets, Sacramento, California.

EVERY employee of the highway commission has a direct interest in the improvement of the highway organization's methods and results, both engineering and clerical, office and field. To that end, the State Highway Engineer invites constructive criticism or suggestions from every employee.

Ideas as to the more economical and efficient handling of your job, or suggestions for elimination of waste will be welcomed. Criticism is also desired from persons outside the organization, who are in a position to give facts.

Send only signed communications addressed as follows: California Highways, P. O. Box 1103, Sacramento, Cal.

FUTURE HIGHWAY BUILDING

To some states that are now just beginning a state road building program, the limited mileage of new construction by the California Highway Commission in 1926 might be taken as a slump in state road construction in California; but the contrary is true. California has had fifteen years of education in scientific road building and the past two years has been a period of transition to a new epoch when state road construction will attain results that will continue to keep us the foremost highway building state in the Union.

Recent legislation, too, shows that financing highway construction has also been perfected. Our law makers have learned that paying as we build is more economical, and that those who use the highways should pay for them.

Contributions Wanted.

State highway building in California has become a vast industry employing many engineers and road experts who daily come in contact with new and interesting features of highway construction. Their problems and how they are met are the things which make CALIFORNIA HIGHWAYS of value to employees of the department and to highway departments of other states and foreign countries. With this in mind every employee of the California Highway Commission should consider it his duty to report to the editor anything that he thinks would be of value to the department.

"Alabama Highways."

The latest addition to the list of state highway department publications is Alabama Highways, published by the Alabama State Highway Department, Montgomery, of which Col. Woolsey Finnell is director, and Henry J. Law and John S. Turner associates. The April issue, which is Vol. 1, No. 1, contains 24 pages, with illustrations showing road and bridge work in Alabama.

Thirty-five Millions For New York Roads.

According to Arthur W. Brandt, State Highway Commissioner, New York State during the coming summer and fall will carry out the most extensive highway building program in its history. It will spend on its roads and highway bridges this year $35,600,000, as compared to $2,200,000 last year.

Germany Builds Roads.

To make Germany a paradise for motor tourists, and to capture more of the business which comes to Europe from America, 9000 miles of improved highways are to be built, connecting every city of importance.

Of No Interest to Engineers.

The most dangerous curve is the one that outlines a dainty ankle and occupies the driver's attention.

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JUNE 1927

California Highways

VOL. 4 NO. 6

The Nevada Transcontinental Highways Exposition

CALIFORNIA BUILDING AT RENO—Interstate cooperation is exemplified in the part California is taking to assist in making the Nevada Transcontinental Highways Exposition a success. This building houses three state department exhibits and many California district and county exhibits.

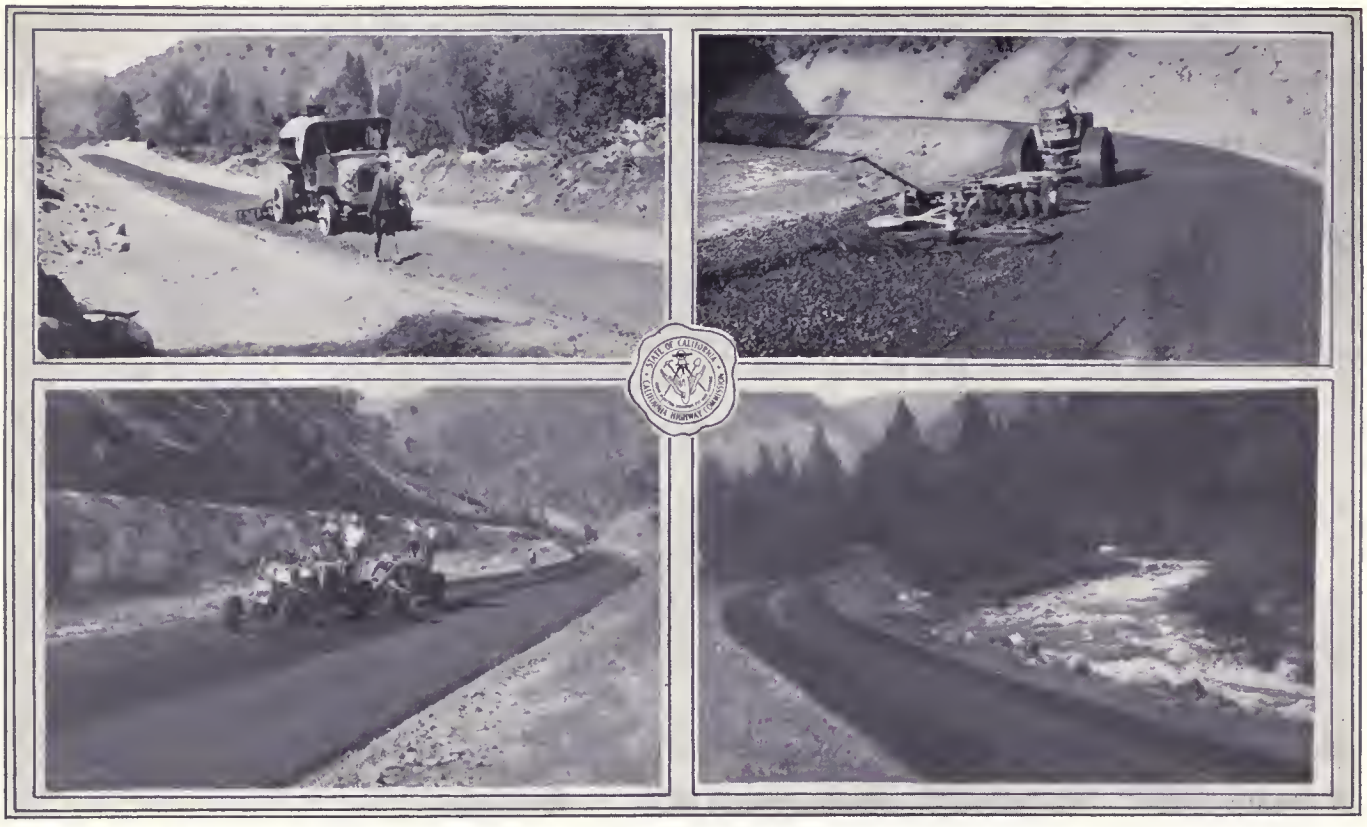
THE POSSIBILITY of driving a motor car with speed and comfort from the Atlantic to the Pacific over the Overland Trail, made famous in the early days by the covered wagon and the pony express has long been the ambition of the American motorist and is the incentive which prompted the state of Nevada to hold the Nevada Transcontinental Highways Exposition. The highway show opened its doors on June 25 and will run until August 1.

With the coming of motor transportation the Overland Trail has taken the name of the Victory Highway. This transcontinental road strikes California at a point of nearest average distance to most of the state's scenic attractions and area of mineral and agricultural production, entering through the beautiful Truckee River Canyon and over the snow-capped Sierras. Once in California you connect with 6600 miles of state highway and much additional mileage of county roads, joining all principal cities, national parks and resorts. Famous for her highways, California invites the thousands of motorists who will attend the Transcontinental Highway Exposition to tour the Golden State.

Among the exhibits attracting widespread interest in the California Building are those of the California State Highway Commission, Motor Vehicle Department, and Agricultural Department. The largest of these exhibits is a typical California highway landscape, displaying the farm resources of the state. Weaving its way through this vast empire of productive land, presenting the different types of road and bridge construction, is shown California's magnificent system of improved highways. A big relief map, 8 feet in width and 19½ feet long, shows the entire state, its mountains and highway system and different points of interest. New highway construction is shown, making the map one of unusual interest to motorists attending the exposition.

At the information booth is to be found information concerning the California state highway system, the state's vast and varied resources, a tabulation of the motor vehicle registration from 1914 to the present time, showing the growth in the use of motor propelled vehicles in California year by year and the tremendous advance in that line during the past few years.

Excellent Results Obtained in Oiling State Highways



OILING THE MARIPOSA-EL PORTAL HIGHWAY TO YOSEMITE—(1) Applying the hot oil. (2) Initial mixing with disc and rotary harrow. (3) Finishing oiled surface with grader. (4) Section of completed oiled surface.

THE RESULTS being obtained with oiling highways in the state system this year are of such a degree of success that the Highway Commission is now fully satisfied that it is the proper method of treating highways during a preparatory period previous to paving. The low cost, the elimination of dust and the resultant smooth surface, almost equal to paving, are factors which now mark the success of state highway oiling.

Oiling Pioneered by Division I.

To T. A. Bedford, Division Engineer for Division I, belongs the credit of being the pioneer in oiling state highways in California. Previous to his success there had been much oiling of roads in California without satisfactory results and when he proposed to oil the Redwood Highway, the principal trunk line in his division, the Commission looked upon the work with considerable doubt. However, results proved highly satisfactory and oiling of unpaved highways in the state system has become a method of maintenance.

T. A. Bedford

In its operations the state uses a lighter oil than is used for oil macadam, having an asphaltic content of from 60 to 70 per cent. Two applications of 0.3 gallons per square yard are made. Between applications dump trucks deposit about an inch of sand and fine gravel, and an abundance of material is kept on hand at the side of the roadbed to be worked into the surface in case more is necessary. Samples of the surface were recently taken on the Redwood Highway where the oiling was done last year and the oiled layer proved to be two inches thick.

Another, known as the mixing method, is being used very successfully. The crushed rock surface is first oiled, 1½ gallons per square yard, being used. A rotary harrow then thoroughly mixes the oil and gravel, assisting penetration. Graders are then used in a movement of the oiled surface as it packs and hardens. Satisfactory results are being obtained in Division VI, on the Mariposa-El Portal highway into Yosemite Valley with the mixing method.

Success in Division VIII with oiling has attracted a great deal of attention, engineers and highway commissioners from several of the western states visiting the oiled roads of that division to learn of the methods used.

In all, a total of 700 miles will be oiled this year, an appropriation of $600,000 having been made for that purpose. The maintenance department has organized the work this year in such a manner that inconvenience to the traveling public has been reduced to the minimum.

"Hard surfaced roads stretching from border to border are welding the American people into a solid, coherent nation, abolishing provincialism and sectionalism, destroying dialects and spreading tolerance and understanding everywhere."

California's Highways Invite Exposition Visitors

California State Highways, like that pictured above, is one of the reasons the Gold State is known as the Motorists' Paradise.

A VISIT TO THE Nevada Transcontinental Highways Exposition will not be complete without a trip into California, and as a few hours' run over a number of scenic routes will land the tourist into the heart of the Golden State, few will return to their homes without having enjoyed the excellent California highways. To assist them in planning this part of their trip, in this issue is described the main routes leading out of Reno, Nevada, into California.

Victory Highway.

One of the popular routes from Reno into California is via Donner Pass or the Victory Highway. Following this route from Reno the California state line is reached with 14 miles of travel, 10 of which is paved, the rest being under construction and about completed. From the state line to Truckee is 19 miles of fine oiled highway. A distance of 14 miles on to Soda Springs Station, rock surfaced, will be oiled during July. The next 12 miles is a dirt road which, with 6 miles of rock surfaced road to Emigrant Gap will also be oiled in July. To Gold Run, 18 miles, has never been graded by the state, and Gold Run to Auburn is a fine oiled rock road. From Auburn 35 miles of paving will take the tourist to Sacramento. From there San Francisco is reached over 98 miles of paving, the Carquinez bridge at Vallejo being an attraction of the route. From San Francisco, Los Angeles is reached by either the coast route or the San Joaquin Valley route. The complete distance from Reno to Sacramento is 145 miles and to San Francisco, 243 miles.

Lincoln Highway.

Another well known route out of Reno to Sacramento is the Placerville or Lincoln Highway, via Carson City, Lake Tahoe and Echo Summit, a distance of 176 miles. Reno to Carson City, 32.5 miles, is paved with concrete. From there on is untreated dirt road to Lakeside, a distance of 27 miles, where the state line is crossed. Meyers is 9.5 miles and from there to Riverton, 31 miles, will be an oiled earth road. Riverton to Pacific House, 5 miles, is now under construction and will be in fair condition. Placerville, famous in the days of '49,

(Continued on page 7.)

Motor Vehicle Law Information for Nonresident Motorists

MANY NONRESIDENT motorists will enter California this year, especially after attending the Nevada Transcontinental Highways Exposition and for their information Frank G. Snook, Superintendent of the Division of Motor Vehicles in California, has issued a statement on the regulation concerning the registration of their cars and the obtaining of nonresident permits as follows:

Unless applicants from other states have registered their vehicles in their own state they are not entitled to a California nonresident permit and must apply for California license within ten days after entering the state. If properly registered in their own state they are entitled to a six months nonresident permit.

To register a vehicle after the six months permit expires, certificate of title will be accepted as evidence of ownership from Alabama, Arizona, Colorado, Delaware, Florida, Indiana, Maryland, Michigan, Mississippi, Missouri, Montana, North Carolina, (North Dakota after July 1, 1927), Oklahoma, Oregon, Pennsylvania, South Dakota, Utah, Virginia and Wisconsin.

From states which do not issue Certificate of Title the following will be accepted as sufficient evidence of ownership:

Certificate of Registration and notarized bill of sale or, Certificate of Registration and original lease contract showing same to have been paid in full or, Certificate of Registration and duplicate lease contract carrying the name of the legal owner and verification by wire of the legal ownership.

Verification of engine number by any State Inspector, State Traffic Officer or other employee of the Division of Motor Vehicles must accompany application in each of the above methods of registration. All papers presented for registration, pertaining to title, must be retained by the division.

Further information on this matter can be secured from any State Traffic Officer.

ARIZONA HIGHWAY PAYS FOR ITSELF

An eighty-two mile section of Maricopa county pavement in Arizona, paid its entire cost in one year, nine months and nineteen days, according to Ira L. Wood, in Arizona Highways.

Mr. Wood uses 2.6 cents a mile as the saving in gas and oil, tires, depreciation and repair bills on the average car, between a paved road and a dirt or gravel road. As authority for this figure he quotes H. G. Borden, former Dean of the College of Engineering, Ohio Northern University.

The Maricopa county road, going east and west from Phoenix, last year carried the equivalent of 816,000 vehicles its entire length. Multiply by 81.9 miles and you get 66,830,400 car miles. At 2.6 cents a mile, the saving to vehicle owners in one year is $1,737,590.40. The road cost $2,866,500 and after adding 5 per cent for interest it was found that the highway paid for itself in less than two years.

Cook Talks on Uniform Casting Specifications.

George B. Cook of the Testing and Research Laboratory at the central office, talked before a meeting of 35 representatives of the northern foundry group of the California Development Association in San Francisco, June 13. Mr. Cook discussed the need for uniform specifications for casting in highway construction and outlined ways in which the foundries can render a better service by their adoption.

TESTS MADE OF NON-SLIPPERY ROADS.

A more economical method of road construction to provide highways that will not soften under heat or be made slippery by rain, is claimed for paving invention tested out in Sweden, the Department of Commerce has been advised.

The new paving, which it is claimed will stand a pressure, at 19 degrees centigrade, of 6.7 tons and four times that pressure at 50 degrees, the corresponding figure for asphalt being 4.6 tons, has been invented by a Swedish engineer who has been working on the problem for 20 years.

The inventor declares his roads will be cheaper than any kind of pavement at present in use, will not be softened by heat and will not be made slippery by rain. Tests made by the Swedish States Material Testing Institute are said to verify his statements with regard to the pressure the pavement will stand.

A special machine, resembling a locomotive, to compress the material, is used.

BEAUTIFYING STATE ROADS

The Long Beach Press-Telegram prints the following on the California Highway Commission's policy of planting trees on the state highways:

"Since 1920, 56,000 trees have been planted along 685 miles of state highway in California. A greater number of trees, planted in earlier years, including those of natural growth, also are being cared for by the State Highway Department.

"This is a wise policy. Trees add to the attractiveness of the landscape, contribute to the comfort of the traveler, and when planted with thought given to visibility at crossings and other danger points, the benefits will be many and the objections few.

"Especially in the warm valleys of the interior, well shaded roads are inviting to the summer traveler, and on the cooler coastal plains it is possible to relieve a sense of barrenness by well designed planting.

"The cost of setting and maintaining roadside trees is considerable, but it is well worth while. The returns in popular appreciation will be larger, for each dollar expended, than for any other investment that the highway commission can make."

NORTH CAROLINA'S ROAD BONDS NOW TOTAL SUM OF $120,000,000

The North Carolina General Assembly has authorized the issuance of $30,000,000 worth of bonds for continuation of the state's highway program.

This authorization brings the total road bond issues authorized by the North Carolina General Assembly since the state's road building program started to $115,000,000.

California has issued a total of $73,000,000 in bonds.

TEXAS CLAIMS NEW PAVING RECORD.

Highway engineers of South Texas claim a new paving record on the La Port road out of Houston. One crew on May 26, in 14 hours and 44 minutes laid 1613 lineal feet of 20-foot, 9-6-9 inch pavement, or 3584.4 square yards, according to a late issue of Western Construction News.

A traveling sunshade, used to protect fresh concrete until covered with earth, is an innovation on this job.

CALIFORNIA HIGHWAYS INVITE EXPOSITION VISITORS

(Continued from page 5.)

Typical valley and mountain California State Highways.

is reached over 19 miles of oiled rock road, and from there to Sacramento, 53 miles, is paved.

An alternate route is available from Meyers via the west side to Lake Tahoe and Truckee. Meyers to Truckee, 48 miles, is a fair earth road, portions being graded to modern standards. From Meeks Bay to Truckee both grading and surfacing are in progress. At Truckee this road joins the Victory Highway. The distance to Sacramento is 190 miles.

Reno to Red Bluff.

Reno to Red Bluff, 195 miles, can be made in from 6 to 8 hours over a good road, all of which is either constructed state highway or under state maintenance. The California state line is crossed at Purdy's, a few miles northwest of Reno; and after a short distance through lands characteristic of western Nevada, the agricultural lands of Honey Lake Valley are entered and traversed from Doyle to Susanville, all of which is a high speed road. From Susanville in a westerly direction to Paynes Creek, 80 miles of excellent scenic mountain road, through timber lands, are encountered, all of which has good alignment and easy grades. The last 25 miles to Red Bluff is through foothills and valley.

At Red Bluff the traveler may either turn southward to Sacramento, San Francisco and the southern part of the state, by way of either one of two paved highways, on the east and west sides of the Sacramento River, or he may turn northward over the Pacific Highway through the scenic northern section of the state, to Oregon and Washington. He may also, if he chooses, proceed westward to Eureka, connecting with the Redwood Highway along the Pacific coast, which makes a comfortable day's travel by auto, through the beautiful timbered Coast Range mountains and into the redwood country.

Yuba Pass Route.

Although not a state highway until Downieville is reached, Yuba Pass route receives considerable attention. From Reno to the state line is oiled. State line to Sattley is earth road but beyond that point to Sierra City has been improved by the Bureau of Public Roads. Sierra City to Downieville is county road. Nevada City, over state highway is reached in 47 miles, where pavement is reached. Grass Valley is next visited, and Sacramento is reached with a total mileage of 190 miles from Reno.

Popular Southern Route.

A popular route into southern California, especially in winter, when it is one of the few routes open, is that south over good Nevada state highways to Carson, Goldfield, Beatty, Tonopah and Las Vegas, a distance of 462 miles. Here may be made side trips to St. Thomas, for a view of the "Lost City," to Zion National Park and the Grand Canyon.

The state line is crossed near Jean, the motorist proceeding over a desolate desert region, typical of Death Valley, to Dagget, 150 miles from Las Vegas. Here the Arrowhead Trail is encountered which, to San Bernardino is either paved or good oiled road, a distance of 84 miles. From there to Los Angeles, 65 miles of paved road, lands the motorist in the southern metropolis, the total distance from Reno being 761 miles.

Other Routes.

Access to California may be gained via the Alpine Highway after July 15. Through Nevada to the state line is 56 miles. To Stockton via Woodfords, 7 miles within California boundaries and Jackson is 128, making the total, Reno to Stockton, 191 miles. This route has wonderful scenic features.

Through the Mono National Forest via Bridgeport, Bishop and Mojave is a route that takes the motorist along the Sierra ridge, past Mono and Owens lakes and across the Mojave desert to Los Angeles. The road through Carson City and Minden is taken out of Reno on this route which measures 510 miles to Los Angeles.

One of the recently built State Highway Bridges in California.

PROVISIONS OF BREED BILL CEMENT STATE UNITY

GETTING ALONG for the past two years with a comparatively small amount of money for construction of new highways has had the beneficial effect of making the people of California realize that unity of thought, purpose and action are necessary for accomplishment. This has been exemplified in the passage of the Breed gas tax bill and its approval by Governor Young. The necessity of the completion of the state highway system brought about the unified action.

The provisions of the bill, introduced by Senator Breed of Oakland, divides the highway system of the state into two classes, primary and secondary. The primary roads include the main trunk lines, interstate connections, county seat laterals and the roads into Yosemite and Sequoia National Park. All other state highways are included in the secondary class. Seventy-five per cent of the gas tax collected in the additional one-cent levy goes to the primary roads and the balance to the secondary.

In signing the bill, Governor Young made the following statement:

"I wish particularly to call attention to the prompt and hearty support of this road-building program on the part of our State Senate and Assembly. I wish also to commend the leadership of our two great automobile clubs in helping to unite all sections of California behind these constructive pieces of legislation. The overwhelming vote by which the bills passed both houses of the Legislature is the best indication of the results their joint efforts have obtained.

"I am especially pleased with the fine spirit of cooperation which has manifested itself in every portion of our state, and which in a few short years will serve to complete a highway system of which we may be justly proud. This cooperation, which made possible the successful passage of these two measures, has given assurance that California will continue to hold its premier position as the motoring paradise of America."

The new tax has no effect whatsoever on the present two-cent tax, half of which goes to the counties and the other half to the state for maintenance and reconstruction work.

The following tabulated statement gives at a glance many interesting facts and figures about the one-cent gas tax:

BREED, S. B. No. 3	Area of State	M. V. Reg.	PRIMARY (75% of Funds)		SECONDARY (25% of Funds)		COMBINED	
			Mileage	Funds	Mileage	Funds	Mileage	Funds
45 Northern Counties	52%	42%	2,345	54.7%	1,771	50%	4,116	53.5%
13 Southern Counties	48%	58%	1,941	45.3%	525	50%	2,466	46.5%
Totals	100%	100%	4,286	100.0%	2,296	100%	6,582	100.0%

SOUTHERN COUNTIES—San Diego, Imperial, Orange, Riverside, Los Angeles, San Bernardino, Ventura, Santa Barbara, Kern, San Luis Obispo, Tulare, Mono, Inyo.
NORTHERN COUNTIES—The other 45 counties of the state.

COSTS OF HIGHWAYS IN CANADA.

A total expenditure of approximately $45,000,000 for highways was made by the Dominion of Canada in 1926, according to advices just received by the Department of Commerce.

STANDING UP FOR A REST.

The street car was crowded. At one stop it took on another passenger. She was young, pretty and wore a trim sport suit. Up jumped a young man and with a polite bow said to the miss, "Won't you have this seat?" "No thank you,' replied the young lady, "I have been sitting down all afternoon—I've been skating."

Big Increase of Motor Tourists Seen for 1927.

A check on incoming travel indicates that 20 per cent more cars came into the state during the first three months of this year than entered during a similar period last year. Approximately 4000 more cars were checked, which, considering the weather conditions prevailing on the transcontinental highways, is a likely indication of the tremendous influx of motor tourists for the year.

Dr. Smith—What did you operate for;
Dr. Jones—Five hundred dollars.
Dr. Smith—I mean, what did he have?
Dr. Jones—Five hundred dollars.

HE HURRIED.

A prize yarn they're telling these days is said to be typical of blase Hollywood, and Broadway, New York, will be quick to understand. The yarn is that one chap telephoned another and excitedly told him to "hurry down to Hollywood boulevard, there's a naked woman riding a horse."

"Be right down; it's been a year since I've seen a horse in Hollywood," was the reply.

Local Politics.

Auto Tourist—"I clearly had the right of way when this man ran into me, and yet you say I was to blame."

Local Cop—"You certainly were."

Autoist—"Why?"

Local Cop—"Because his father is Mayor, his brother is Chief of Police, and I go with his sister."—Bison.

Magnificent Distances.

"Well, how was motoring in Manchuria?"
"We had one detour of 2000 miles."

Man (at restaurant): "Waiter, do you serve fish?"
Waiter: "Yes, we cater to everyone."

New Legislation Affecting the State Highway System

IN MAKING an investigation of the approved bills affecting state highway legislation, the Highway Commission finds that more measures of value to the development of the State Highway System were passed by the Legislature and approved by the Governor in the 1927 session than at any session of recent years.

The measures show that the Legislature desires to safeguard the investment in and insure the development of the State Highway System, as well as to regulate its operation as a transportation system. However, without the broad understanding and encouragement rendered by Governor Young, some of the new legislation might not now be taking its place in the law books of California.

Some of the measures of most importance to the highway system are briefly described

Senate Bill 3. This bill was introduced by Senator Breed of Oakland. It provides an additional one cent tax on gasoline, the proceeds to be used entirely for further construction on the State Highway System. This bill fulfills the aspirations of Highway Commissions since 1921, and carries out the recommendations of the Highway Investigating Committee. It places new highway construction on a permanently financed basis and provides a substantial annual revenue therefor. During the 79th and 80th fiscal years, the new tax should produce about $15,500,000.

Senate Bill 518 was also introduced by Senator Breed.

This legislation simplifies the Highway Commission's problems in allocating funds by classifying the highways in both northern and southern sections of the state. Long standing disagreements between sections as to the relative amount of highway expenditures are settled as the result of this legislation.

Senate Bills 708 and 709 were introduced by Senator Wagy of Bakersfield. These measures repeal the gross receipt tax on commercial vehicles and trucks as embodied in former legislation, which tax has proven impractical of collection. They substitute increased registration fees for commercial vehicles in lieu of the tax provisions of the repealed bills.

Senate Bill 864 was introduced by Senator Nelson of Eureka. This bill legalizes the Highway Commission's policy in widening state highways, by fixing a minimum width of 80 feet for state highway right of way. Obtaining wider rights of way has become a difficult part of our problems. The fixing of a legal minimum width of 80 feet will be of incalculable assistance.

Senate Bill 885 was introduced by Senator Fellom of San Francisco. This legislation recognizes the growing public dissatisfaction with the slow transportation afforded by ferries, and the commercial value of toll bridges. It directs the State Highway Commission to investigate the toll bridge situation and report to the next Legislature on a plan for taking over by the public of all toll bridges on the State Highway System. The matter to be investigated is whether such structures should be owned by the public and operated at public expense or whether they should be built by private funds and paid for by the user in tolls which cover interest, repairs, depreciation and profits.

Senate Bill 847 was introduced by Senator Rush of Suisun. This bill recognizes an emergency and appropriates funds in the amount of $120,000 for the reconstruction of the Sacramento River bridge at Rio Vista, a lengthy structure, on a Legislative Act Road. Under the emergency appropriation, the bridge will be completed before revenue is available from the new gas tax.

Assembly bills of most interest to the highway organizations are as follows:

Assembly Bill 404 was introduced by Assemblyman Crittenden of Tracy. Its purpose is to clarify responsibility for the maintenance of irrigation structures on public highways.

It provides that those owning, maintaining and operating irrigation ditches requiring structures across the highway, must keep such structures in repair; however, when such structures are built in a permanent manner in accordance with plans approved by the county officials, their maintenance afterwards shall devolve upon the county.

Assembly Bill 1175 was introduced by Assemblyman Noyes of Yuba City. This bill appropriates $200,000 for the construction of a causeway across the Sutter by-pass. This territory was divided several years ago by reclamation works under the control of the state. The appropriation provides for bridging the by-pass, and probably will be supplemented by Sutter and Yolo counties joining to improve the adjacent highway connections, thereby creating a short cut from Yuba City to Woodland.

Assembly Bill 1284 was introduced by Assemblyman McDonough of San Francisco. This provides $600,000 from the General Fund for the purpose of paying the wages of convicts employed in road construction camps. Wages of prisoners average about 30 per cent of the total highway construction expense of these camps, and the highway funds are supplemented to that extent.

The bill also provides that convicts, when so employed, shall not come under the provisions of the Workmen's Compensation, Insurance and Safety Act of 1917.

Assembly Bill 1292, introduced by Assemblyman Byrne of Los Angeles, authorizes the transfer of State Prison Board funds to Highway Commission funds in a sum not in excess of $100,000. This recognizes the justice of claims of the Highway Commission that prison appropriations for maintenance of convicts should be extended to prisoners employed in road camps. Highway funds devoted to prison road construction are supplemented to that extent by the measure.

Another enactment of great importance was Assembly Bill 1119, introduced by Assemblyman Feigenbaum of San Francisco. This bill creates a Department of Public Works, and creates a Highway Commission of five members as a division therein. Its purpose is the centralizing of all public works of the state under the jurisdiction of a director, who will serve as a member of the Governor's cabinet. From the administrative angle of the Governor and the Board of Control, responsibility is centralized under the new arrangement.

The most outstanding feature of the legislative policy was the absence of additions to the State Highway System. During the past few years, those interested in state highway matters have realized more and more that funds provided could never accomplish the completion and adequate maintenance of the state system unless its mileage was limited. An equitable division between the state and the various counties of responsibility for public highway construction and maintenance is necessary if state highway affairs are to be prosecuted in a business-like manner.

REVISED EDITION OF STANDARD SPECIFICATIONS

By L. V. Campbell, Office Engineer.

A REVISED edition of the standard specifications of the California Highway Commission is now on the press and is expected to be available for distribution shortly after the appearance of this issue of the Bulletin.

In furtherance of the general movement for uniformity in specifications, this edition has been made to conform with the form and arrangement approved as standard by the American Association of State Highway Officials. This has made necessary a rearrangement of the order in which the different sections covering the various items appear.

The general provisions, which included the first 38 sections of the 1925 specifications, have been rearranged and enlarged. The former general provisions have been incorporated in the appropriate place in the new arrangement, together with considerable new text. The additional matter includes a more complete definition of terms, and goes into more detail in order to set forth clearly many points which had formerly been omitted.

The revisions of the construction details are more in the nature of bringing the specifications up to date so as to conform with present practice and to incorporate in the standard specifications those details which are at present included in the special provisions.

The principal changes which will appear in the standard specifications are briefly outlined below:

New methods of test for determining the suitability of surfacing materials and aggregate for concrete have been included and are made a requirement for such materials. These particular methods are peculiar to the laboratory of the Commission and were developed as a result of research, to improve on the older methods of test in general use, and to supersede the specification for French Coefficient and the Deval Abrasion tests. These tests are fully described in the issue of April, 1926, of California Highways and are briefly described in the general provisions of the revised specifications.

The work of clearing and grubbing has been separated from the grading specifications and included in a separate section with the view of making clearing and grubbing a separate pay item where that work is of any considerable extent; incidental clearing and grubbing such as encountered on usual reconstruction projects will be included in the grading as has been our previous practice.

The section on grading has been somewhat rearranged and the specifications for structure excavation placed in the grading section; payment for structure excavation, however, will be made as an item separate from the grading as heretofore.

The specifications for rock borders has been revised to conform with our present practice as included in the special provisions for each contract.

The specifications for waterbound macadam base have been separated into two sections, one for type "A" and one for Type "B." The specifications for type "A" macadam have been rewritten to require that stone screenings be used for filler and that they be worked into the voids by rolling and watering. The specifications for type "B" macadam remain the same as formerly with the addition of the Rattler test and Cementing test to determine the suitability of the material.

Only one type of bituminous macadam surface is included in the new edition, this beng the type "C" of the 1925 edition. In general this section remains the same with the addition of the abrasion and toughness requirements heretofore mentioned.

Side forms for asphalt and concrete pavement have been included in a separate section, and the specifications for side forms taken out of the sections covering paving.

The Rattler tests have been substituted for the French Coefficient requirement for broken stone for asphalt concrete base; also broken stone may be made by crushing boulders larger than 8 inches and screened gravel is permitted for that portion of the aggregate smaller than ¾ inch. The grading of material for type "A" asphalt concrete surface has been revised to provide for a higher dust content as has been included in some of the latter asphalt surfacing contracts. Also the surface finish specifications have been revised to provide for asphalt coated stone screenings rolled into the hot mixture.

The specifications for Portland Cement Concrete pavement have undergone some changes, and the new edition will provide for paying for one-half of the additional concrete placed on low subgrade at the contract price up to 5 per cent of the theoretical amount required. Also a variation of 2½ per cent of cement either way will be permitted, and any excess or deficiency greater than 2½ per cent variation will be paid for or deducted. Joints in pavements have been revised to conform with our present practice and provide for a longitudinal joint of the weakened plane type to be cut in the pavement; also expansion joints of asphalt and cork composition to be placed at 60 foot intervals with a cut or dummy weakened plane joint at 20 foot intervals. The reinforcement of edges of concrete pavement is included as standard in the revised edition. The time of curing has been reduced to eight days and the time of opening to fourteen days, depending upon the mudulus of rupture of the concrete.

The section on reinforced concrete structures has been expanded and foundation treatment for structures included in this section. Also revisions have been made for foundation bearing tests and the specifications for arch rib construction included in this section. Various other minor revisions have been included.

In the section for timber structures, a specification has been included for laminated or strip floors, other minor revisions have also been incorporated.

The strength requirement for reinforced concrete pipe culverts has been increased and the shell thickness slightly increased in some of the sizes.

The specifications for rip rap have been rewritten to provide for two types; light rip rap and heavy rip rap.

A section has been added for underdrains which includes both tile drains and perforated metal pipe. The specifications for drain tile have been expanded from that in the former edition.

The section for guard rails has been revised to provide for laminated rails in addition to the solid rail.

The following sections not included in the 1925 edition have been added to the 1927 edition: Vitrified clay pipe, waterproofing, drainage system for subways, and fuel oil. Also cuts showing the design for standard structures are included.

The 1927 edition of the standard specifications will be put into use as soon as they are received from the printer and

(Continued on next page.)

HIGH HEAD PUMPING ON PAVING JOB

The necessity of securing water for the Mountain Springs paving job in San Diego County probably resulted in the establishment of a new record for the highest head encountered on any paving project in California.

It was necessary to secure water at Jacumba and to pump it over a summit 4.4 miles east, from which point it flowed by gravity to the work. The difference in elevation between Jacumba and the Summit Reservoir was about 417 feet. The amount of water required was estimated at 300 gallons per minute. The total elevation between the summit and the lowest point to which the water was carried for use was 1753 feet.

The pumping to the summit was accomplished by means of a 2½ inch six-stage type MMB horizontal centrifugal pump with bronze impellers. The pump was operated by a 5⅜-inch by 6¼-inch, 4-cylinder Waukesha Industrial Power Unit with twin disc clutch power take-off. A 4-inch welded steel line was used to convey the water to the summit and this line crossed the highway ⅜ of a mile east of the pumping station, with two 45° angles.

In order to insure full discharge, a booster pump was located 2.6 miles from the first pump. This was a 4½ by 5½ Triplex pump, also driven by a Waukesha motor. The piping was so arranged, that the water could be passed through the pump or by-passed around it, which made it possible to operate either only the first pump or use both pumps at the same time.

GRAVEL ROADS PREDOMINATE IN FEDERAL AID SYSTEM

Gravel roads predominate in the 55,903 miles of Federal Aid roads constructed through the country, according to percentages recently published as follows:

	Percent	Mileage
Gravel type	35.5	19,845.56
Graded and drained	23.2	12,969.50
Concrete pavement	22.0	12,298.66
Sand clay	8.1	4,528.14
Bituminous macadam	5.6	3,130.57
Bituminous concrete	2.4	1,341.67
Water bound macadam of brick	3.2	1,788.90
Total	100.0	55,903.00

During the past year there were improvements on 9400 miles of the Federal Aid System, bringing the total improved highways in the system to 55,903 miles.

REVISED EDITION OF STANDARD SPECIFICATIONS

(Continued from page 10.)

distributed. A copy will be sent to each person or firm whose name is on our mailing list to receive copies of notice of contractors of work advertised for bids.

Our present practice will be continued of issuing special provisions for each contract that is advertised; these special provisions will contain data and direction relating to the particular project and such modfications from the provisions of the standard specifications as may be necessary to complete the proposed improvement as contemplated. The special provisions are not complete specifications for a job being supplementary to the standard specifications.

PUBLIC APPRECIATE WORK OF COMMISSION THROUGHOUT STATE

That the work of the California Highway Commission is a credit to the administration is reflected in communications coming into the central office from a number of the divisions.

The Coast Auto Lines of Grants Pass, Oregon, appreciatively commend the Division I maintenance work from the state line to Adams Station, Del Norte County, during the winter months.

The city authorities of Larkspur, Marin County, Division IV, have written a letter of praise for the recent improvement in their town. The Chamber of Commerce at Encinitas, Division VII, is thankful for prompt and efficient work in their community, while the Bear Valley Supper Club of Fawnskin, San Bernardino County adopted resolutions commending recent improvements by Division VIII.

REDWOOD HIGHWAY INSPECTION TRIP

During the first week in June the Highway Commissioners made an official inspection trip over the Redwood Highway from Sausalito to the Oregon line. Conferences were held at a number of points where the requests of representative citizens regarding state highway work were heard and present and prospective routes were inspected.

The Commission's party was received with extreme cordiality at all stops and learned of the highway desires of the regions visited. At over-night gatherings and other meetings the Commissioners were able to meet community leaders and much good-will evolved from the exchange of ideas concerning the future of the California highway system. To the Commerce Chambers of Santa Rosa, Upper Lake, Ukiah, Eureka and Yreka, the Commissioners are duly thankful for splendid receptions. They also met Cloverdale, Fort Bragg, Crescent and Montague committees, gathering information concerning many state highway problems.

A conference with the Oregon commissioners, at which interstate connections were discussed and inspection of the Pacific Highway from the Oregon line to Sacramento, completed the trip.

HIGHWAY COMMISSION ATTENDS EXPOSITION OPENING

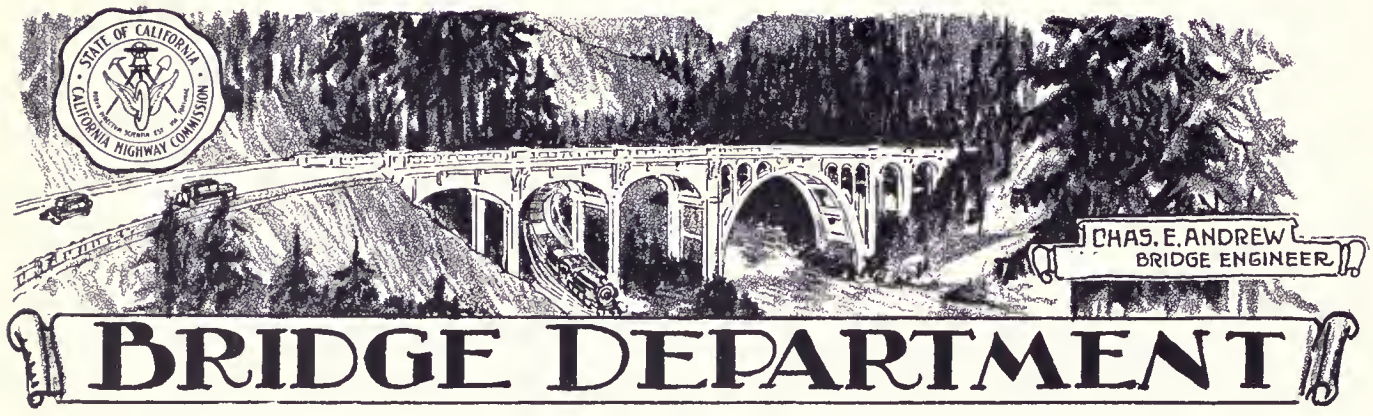
The party composed of California state highway officials attended the official opening of the Nevada Transcontinental Highways Exposition on June 25. They commented very favorably on the affair and were well pleased with the showing being made by California. The California building is a substantial part of the exposition.

The Commissioners spent most of the trip on an inspection of the Auburn-Truckee, Lake Tahoe and Placerville routes of the State Highway System.

New York City Has Army of Snow Fighters.

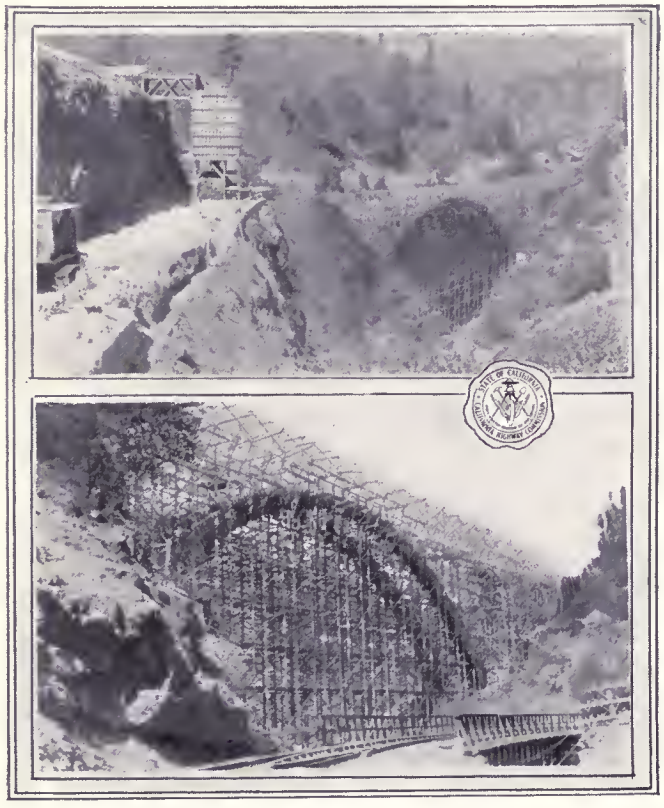
New York has 700 pieces of motor-driven equipment and 1500 trucks available for snow removal. The metropolis is planning to keep the streets clear of snow and prevent traffic tieups caused by unfavorable weather in winter.

The final link in the "dustless route" from San Bernardino to Daggett has been completed. Highway commission crews have carried into Daggett the oil-gravel roadway started in Victorville a year ago. Fifty miles of the desert has been spanned with the new highway.



BRIDGE DEPARTMENT

CONSTRUCTION UNDER WAY ON HARLAN D. MILLER MEMORIAL



Falsework for Harlan D. Miller bridge in the Sacramento River Canyon; view taken from the S. P. tracks.

Above—Plant layout and falsework, Harlan D. Miller bridge.

Timber spider-web in the falsework for the Harlan D. Miller Memorial Bridge, forty miles north of Redding on the Pacific Highway, has been constructed. Footings, arch abutments and arch ribs have now been placed on this contract, which is one of the longest arch spans ever built by the state, being 230 feet on springing line.

Owing to the great length and weight of the ribs, and the very high rise of arch, which tends to cause deformation of falsework during placing, some unusual problems had to be dealt with.

The upper photograph shows the plant layout of Bordwell and Brugge. Aggregate in three sizes is trucked into the bunker, from the present traveled way, and measured into the mixer under bunker through hoppers. The whole plant being at the higher end of the bridge. By this system the proportioning of cement has been of remarkable accuracy, and economy of handling is obtained by the movement of materials being continuously downward to forms.

This is Resident Engineer Johnson's third highly artistic and spectacular bridge on this route. The combination of bridges, the remarkable alignment and finish of work on the new Division II road construction gives an engineering effect probably unsurpassed in the state.

BRIDGE ROADWAY TO BE 140 FEET ABOVE STREAM BED

In addition to the three other bridges noted, a fourth bridge at Pollards Gulch is to be constructed on this route near La Moine, which will consist of a single 200-foot arch span and 200 feet of concrete approach spans, making a total length of 400 feet. This structure is to span Pollards Gulch at a point where the banks are steep and rocky, thus making an ideal site for an arch structure. The bed of the stream will be 140 feet below the grade of the roadway. Pilasters over the arch abutments will have a height of approximately 55 feet. It is anticipated that the construction of this structure will be under way this season.

SUGAR IN CONCRETE.

Recently two cases of failure of concrete to harden in Egypt, where sugar is very plentiful, led to an investigation of the effects which sugar has on the setting of concrete.

After thorough investigation it was found that sugar combines with lime to form saccharates. These destroy the resistance of the concrete in the Le Chateleir tests, and the lowering of the strength is proportional to the amount of sugar present.

Interesting cases of the failure of concrete due to sugar content came to light during the investigation. In one instance, certain portions of a building failed to set and a sugar content of 2 per cent was found in the cement. It was discovered that this sugar came from the bags which had been filled with sugar before being used for cement.—Tech News.

BRIDGE DEPARTMENT NEWS

M. E. Whitney recently completed his work on the Del Mar overhead crossing in San Diego County and is now enjoying a tour through Nevada and Utah. He will be in charge of the Galivan overhead crossing in Orange County.

J. A. Maurer and Sons of Eureka have been awarded the contract for the construction of Slate Creek bridge in Shasta County. This work will be under the supervision of W. H. Johnson. W. H. Carpenter will assist on this project.

W. S. Kingsbury, Jr., is enjoying his vacation in Los Angeles.

W. G. Remington, having recently completed the work on Gaviota Creek bridge in Santa Barbara County, is enjoying a vacation in the Bay district, after which he will have charge of the construction of Wildcat Creek bridge in Contra Costa County.

Frederickson and Brothers of Stockton have been awarded the contract for the bridge across Stockton diverting canal. Guy Mayes, who recently completed the Viejas Creek bridge in San Diego County, will have charge of the work.

E. K. Elder, L. C. Hollister and Lloyd G. Marshall are new employees of the department. Elder and Hollister have been assigned office duties and Marshall will assist W. H. Johnson on the Shasta County bridges.

W. J. Christy, who has been assisting G. W. Thompson on the South San Francisco undergrade crossing, will be assigned to the construction of the three concrete girder bridges across Tassajaro, Alamo and Las Positas creeks in Alameda County.

Leonard T. Isham of Rio Vista has been awarded the contract for constructing the timber trestle across Sacramento River near Rio Vista. W. B. Anderson, who was in charge of the construction of Las Flores creek bridge, has been assigned to this work.

O. P. Dodds will assist Harry Carter in the construction of the Ben Ali undergrade crossing north of Sacramento.

Announcement was received recently of the marriage of Jean P. Winslow and Anna Calvin in San Francisco on June 5.

Because of the illness of his mother, S. Potashnick is leaving the department on July 15, accompanied by his family, for an extended trip to the east.

R. W. Van Stan, who was recently transferred from Division VII to the Bridge Department, is assisting A. B. Willett on the Santa Ana overflow bridge.

Trestle Replaces Sand Fill.

A gap in route 60, opened by high flood water, together with an unusually high tide, removed nearly 1000 feet of sand fill and pavement at a slough near Huntington Beach, has been closed and the section again placed in first class condition by the completion of a timber trestle at Santa Ana overflow channel. Since the traffic at this point is about 16,000 cars per day, future widening of this section was anticipated in the design of the bridge, which carries a 34-foot roadway and a 6-foot sidewalk.

Bridges Widened to 40 Feet.

Heavy and rapidly increasing traffic on this route made advisable the widening of three bridges near the Los Angeles-Ventura county line, at Las Virgines Creek, Vejor Creek, and the West Fork of Vejor Creek, to accommodate a 40-foot roadway. Slight repairs were also made to the bridge across Conejo Creek. J. W. Wilson was resident engineer.

DELMAR OVERHEAD AWAITS CONSTRUCTION OF APPROACHES

Del Mar overhead crossing in San Diego County, just completed and awaiting construction of approaches.

Following the program of grade separations being worked out over the state, an overhead crossing of the A. T. & S. F. Railroad has been recently completed at Del Mar, San Diego County. The design of this bridge follows the girder type of construction. Column bents support 45, 47 and 28 foot spans. M. E. Whitney was in charge.

South Gets Improved Structures.

The Coast road, route 2, from San Francisco to San Diego, has been further improved by the construction of two bridges, an overhead crossing and repairs and widening of four bridges, all of which have been completed this month and with the exception of the overhead crossing, are available for travel.

The most northerly of these structures is at Gaviota Creek, about 30 miles north of Santa Barbara, where a reinforced concrete, four span, girder type bridge replaces an old steel bridge. The new crossing made possible a realignment which increased the radii of three curves. Federal aid was obtained for this project which was built under the direction of W. G. Remington, resident engineer.

WHAT SOME OTHER STATES ARE DOING IN ROAD IMPROVEMENT.

ILLINOIS—The budget for 1927 of this state is $36,000,000 for the primary roads and $70,000,000 for its entire road system. Illinois now has 4500 miles of paving on its primary roads and 1300 miles on secondary roads. In this state there are, too, 5966 miles of completed hard roads in the state's highway system, and 1947 miles of grading completed.

KANSAS—Since June, 1921, more than $12,000,000 has been spent for bridges on the state and county systems. At least 50 per cent of the county roads, though not graded to standard, have wide and well-kept roadways and are generally in good condition in dry weather.

MARYLAND—Maryland's state road system was designated in 1908, and was the first system to be placed entirely under state control for both construction and maintenance.

NEW JERSEY—A program for improvements of the highways of this state, to cover approximately 1900 miles, extending over a twelve year period at a cost of $60,000,000, is scheduled for presentation to the Legislature early next year.

VIRGINIA—Virginia will spend nearly $10,000,000 for good roads this year. The state highway commission has provided for an expenditure of $8,000,000 to improve the main highways and $1,250,000 to improve feeder roads.

WEST VIRGINIA—Governor Gore has affixed his signature to the road bill of the 1927 Legislature, making it possible to reissue $15,000,000 worth of bonds to carry out West Virginia's highway program.

WISCONSIN—The funds of the state highway commission for 1927 are estimated at $24,566,000 and the plans for the year include 374 miles of paving. Wisconsin has about 2070 miles of pavement.

WHAT THE DIVISIONS ARE DOING

The Grade III and Grade IV Engineers sometime in oral examination encounter questions of highway economics which are new to them. The Examining Boards report that there is too little evidence of outside reading and keeping up with new developments and trend of experiments in highway data.

A very instructive bit of reading is found in the engineering bulletins of the State College at Pullman, Washington. Several progress reports are available on the relation of road surfaces to automobile tire wear, and all publications contain results of actual tests on wear, as well as progress reports on other investigations.

Every highway engineer will profit by the perusal of the third progress report in their engineering bulletin No. 18.

DIVISION I.

HEADQUARTERS, WILLITS.

T. A. BEDFORD, DIVISION ENGINEER.

Counties of Del Norte, Humboldt, Mendocino, and Lake.

It Rains in Del Norte.

As the California Highway Commission is being asked to do highway work in Del Norte county, it might be of interest to the Commission and contractors that for six months of the year it rains enough in any one month to do many parts of California for an entire season. The following is the past season's rainfall record as clipped from the Crescent City American:

September	1 55	inches
October	8 47	inches
November	23 63	inches
December	12 04	inches
January	15 94	inches
February	18 46	inches
March	10 28	inches
April	6 20	inches
May	2 32	inches
Total	98 89	inches

San Diego Bridge Gets Federal Aid.

Las Flores Creek in San Diego County is now crossed by a 150-foot reinforced concrete girder type bridge. The cost of this job was increased considerably by the necessity of a detour trestle and on account of extensions to the apron or concrete mat paving placed in the stream bed at the bridge site. W. B. Anderson was the state's engineer. The total cost of this job, part of which was paid by Federal Aid, will approximate $30,000.

DIVISION VII.

HEADQUARTERS, LOS ANGELES.

S. V. CORTELYOU, DIVISION ENGINEER.

Counties of Los Angeles, Ventura, Orange, San Diego, and eastern Kern, south of Mojave.

76-Foot Highway for Orange.

A 76-foot pavement will be the result of the work now being done at Laguna, Orange county, on the Oxnard-Capistrano highway. The state has finished and opened its part of the job, 20 feet in width, and the rest is now being done by an improvement district under the supervision of the state. Between Myrtle Street and Cliff Drive, the pavement will be 72 feet wide with curbs. Southerly from Cliff Drive, the pavement will be 56 feet wide between curbs.

Ora-2-C: View of new 56' concrete pavement and curbs near Tustin, Orange County.

Other Paving Jobs Progressing.

On the reconstruction of the Coast Highway westerly from Ventura, good progress is being made. The 20 foot concrete is completed for a distance of 3.4 miles. Back of the concrete seawalls along this stretch the pavement is 30 feet wide.

In addition to the completed pavement over 5 miles of half-width pavement, 10 feet wide, has been laid.

All grading work has been completed on the approaches to the new Carlsbad Overhead Crossing of the Santa Fe tracks in San Diego County, and the placing of the bituminous macadam pavement is nearly completed.

The concrete pavement is now completed and open to traffic on Mt. Springs Grade in San Diego and Imperial counties.

Wedding Bells in Division VII Headquarters.

Miss Marie Carmel, popular member of Division VII's office force, recently gave her friends quite a surprise by coming down to the office one morning with a brand new name. She is now Mrs. H. F. Dahlman.

Also the "spring time influence" was felt at the Lankershim Shops, resulting in the marriage of Carlotta Morgan and Chas. H. Berry, both well known employees at the Lankershim Shops. Mr. and Mrs. Berry are now taking their vacation in Canada.

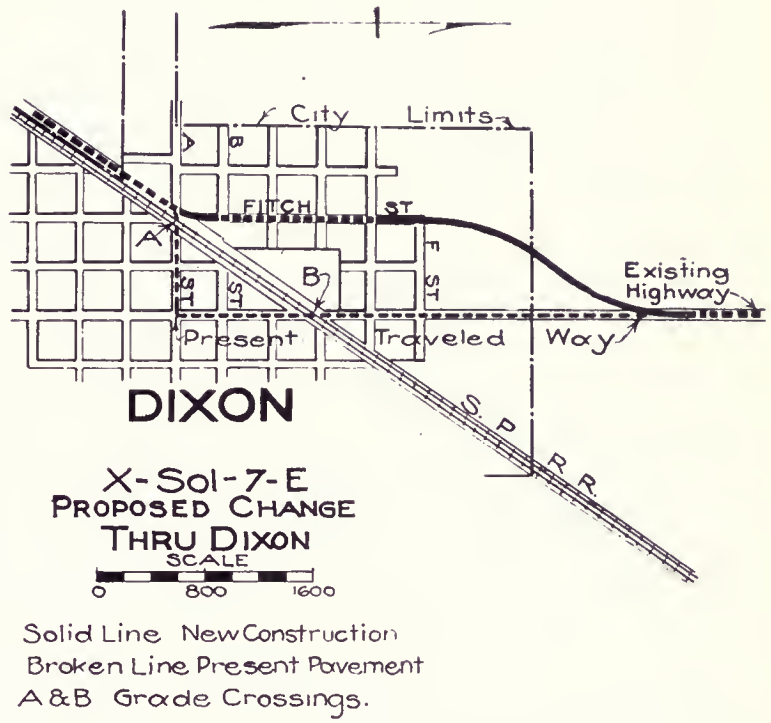
Work on Dixon Rerouting to be Done this Summer

(Reported by R. E. Pierce, Acting Division Engineer, Division X.)

THE Highway Commission has directed that immediate steps be taken to proceed with the acquiring of the necessary rights of way for the state highway on a new alignment through the town of Dixon, to eliminate two grade crossings with the Southern Pacific railroad inside the town, which have been the cause of several fatal accidents in recent months, one of which resulted in all but one of a stage load of ten people being killed.

Approaching from the south, this line will leave the present route of the highway at "A" Street, thence along Fitch Street to its north end, thence along two easy reverse curves across the private right of way into the present highway about 1000 feet north of the city limits of Dixon.

As soon as the rights of way are acquired, it is planned this year to place the necessary drainage structures and grade and gravel a roadway so as to have a satisfactory foundation for the permanent pavement next year. Some of the property owners are a little extravagant in their ideas of values of their property and it has become necessary to condemn some of these properties.



DIVISION IV.

Headquarters, SAN FRANCISCO.

JOHN H. SKEGGS, Division Engineer.

Counties of San Francisco, Marin, Sonoma, Napa, Contra Costa, Alameda, Santa Clara, Santa Cruz, and San Mateo.

REDWOOD CRIBBING—On the Big Sur highway south of Carmel; used to repair recent spring storm damage.

MINIMUM AUTO LICENSE $300.

With all its advancement, Japan sticks to its old-fashioned jinrikisha as a pleasure craft, probably because the cheapest automobile license in that country is $300. Most of us in the good old U. S. A. kick because we have to pay ten bucks for a license on a machine that will go like—(well, you know, if you own one)—and come back the same way.

DIVISION X.

Headquarters, SACRAMENTO.

R. E. PIERCE, Acting Division Engineer.

Counties of Amador, Calaveras, Alpine, Tuolumne, Stanislaus, San Joaquin, Solano, and southern Sacramento and Yolo counties.

Sixty Miles Oiled.

The entire oiling program was completed on June 11, there being 60 miles treated, as follows: San Andreas to Clements, San Andreas, 2½ miles south towards Angels Camp 2½ miles east of Jackson to Clay Station, and from Keystone to Jamestown.

Construction Activities.

Proposals for grading and surfacing with standard road surfacing and crushed rock or stone of that portion of the state highway north of Stockton from the northerly city limits at Wilson Way to Cherokee Station, a distance of approximately 2½ miles, will be received July 11, 1927.

Construction of the sand fill approaches to the new bridge over the San Joaquin River at Mossdale is progressing rather slowly. However, we expect to have this road ready for traffic at approximately the same time as the bridge is opened.

Right of Way Matters.

The Right of Way Department is experiencing a little difficulty in securing deeds for right of way for a line change through the town of Dixon. As soon as the right of way matters have been settled, this unit will be advertised for construction. The construction proposed consists of grading 40 foot roadbed and placing a 20 foot by 6 inch gravel surface connecting with the present pavement at Fitch Street.

STATE HIGHWAY FUND CONTRACTS (Bond Funds, Including Federal Aid)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE MAY 11, 1927.						
503	VIII	Imperial	26	H	Between Brawley and Westmoreland	6.46	Grading and Rock Surfacing	F. C. Payton	$120,890 26	June 28, 1926	
509	VIII	Riverside	64	D-E	Between Black Butte and Blythe	9.50	Grading and Rock Surfacing	S. Y. Faucett	87,500 00	July 14, 1926	
516	V	San Benito	2	E	Across Gaviota Creek near Gaviota		Concrete Girder Bridge	Oberg Brothers	23,411 25	Nov. 16, 1926	
520	VIII	Imperial	26	F	Adams Ave. to north city limit El Centro	0.50	Grading and Rock Surfacing	C. E. Pitzer	9,053 56	Mar. 28, 1927	
					AWARDED SINCE MAY 11, 1927.						
525	VII	Los Angeles, Orange	60	E-A	Between Naples and Anaheim Bridge	1.50	P.C.C. Pavement	Matich Brothers	59,427 56	June 1, 1927	75
526	II	Plumas	29	A	Between Lake Almanor Causeway and Chester Grade	0.86	Grading and C.M. Culverts	C. B. Clendenning	12,024 56	June 1, 1927	75
					Total State Highway Fund Contracts Awarded	2.36			$71,502 12		

NOTE.—Primary construction covered by the above contracts does not include funds obligated on cooperative forest highway projects, prison camp road activities, or day labor jobs not being done under contract.

STATE HIGHWAY MAINTENANCE FUND CONTRACTS (Including Gasoline Tax Fund)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE MAY 11, 1927.						
M-118	II	Shasta	3	C	Between Dog Creek and La Moine	4.45	Grading and Standard Surfacing	George Pollock Co.	$316,770 56	April 23, 1926	
M-135	VII	San Diego	2	A	Over A. T. and S. F. Railway at Del Mar		Concrete Girder Bridge	John Short	34,506 56	July 30, 1926	
M-139	VII	Los Angeles, Orange	2	D-F	Between Michigan Ave., Whittier and La Mirada St.	3.77	Grading and P.C. Concrete	George Herz and Co.	205,573 11	Aug. 28, 1926	
M-144	IV	Marin	1	B	Through Ross and Larkspur	2.46	Asph. Conc. Widening and Surfacing	Pacific States Const. Co.	108,190 91	Sept. 14, 1926	
M-155	VII	Los Angeles-Ventura	2	C-B	Las Virgenes, Vejor and West Fork of Vejor Creek		Widening Three Bridges	Henry Averbach	23,989 78	Oct. 29, 1926	
M-156	VII	San Diego	2	C	Across Las Flores Creek, near Las Flores		Concrete Girder Bridge	Sidney Smith	28,372 50	Oct. 29, 1926	
M-166	II	Tehama	29	A	Paynes Creek		Maintenance Buildings	Martin Construction Co.	4,607 00	Mar. 28, 1927	
					AWARDED SINCE MAY 11, 1927.						
M-169	VII	Orange	60	A	Santa Ana River		Cleaning and Painting Bridge	W. M. Ledbetter and Co.	3,183 75	June 1, 1927	75
M-170	V	San Luis Obispo	33	A-B	Paso Robles East		Painting Three Bridges	D. E. Burgess	10,108 13	June 1, 1927	60
911EC1	II	Shasta	3	C	Across State Creek at La Moine		R.C. Girder Bridge	Fred J. Maurer and Son, Inc.	26,063 44	June 23, 1927	225
92EC1	II	Shasta	3	D	Between La Moine and Shotgun Creek	6.67	Grading and Rock Surfacing	A. Haidlen Co.	317,109 26	June 23, 1927	250
94EC1	IV	San Mateo	2	A	Between Colma and Cypress Lawn Cemetery	1.50	P.C.C. Pavement	Hanrahan Co.	203,769 45	June 23, 1927	75
97FC1	VII	San Diego	2	A	At Del Mar	0.80	P.C.C. Pavement, Crossing Approaches	John and Bressi Const. Co., Inc.	64,796 54	June 23, 1927	150
911EC2	X	San Joaquin	4	C	Across Stockton Diverting Canal		R.C. Girder Bridge	Frederickson Brothers	31,406 06	June 23, 1927	125
					Total State Highway Maintenance Fund Contracts Awarded	8.97			$656,436 63		

NOTE.—The above obligations charged against the State Highway Maintenance Funds do not include funds from these sources obligated for general maintenance and for specific betterments being done under day labor authorization.

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CALIFORNIA HIGHWAYS

A BULLETIN ISSUED BY THE CALIFORNIA HIGHWAY COMMISSION FOR THE INFORMATION OF ITS EMPLOYEES AND THE PUBLIC

Vol. 4 JULY, 1927 No. 7

RESULTS OF COOPERATION.—Beautiful view of newly finished state highway near Whittier, the result of cooperation between Los Angeles County, a local road improvement district, and the California Highway Commission.

In this issue: WHAT REORGANIZATION MEANS TO THE HIGHWAY DEPARTMENT.

CALIFORNIA HIGHWAYS

This Bulletin is published by the California Highway Commission for the information of its employees and the public. Editors of newspapers and others interested are welcome to use, without restriction, any of the matter herein contained. Cuts will be gladly loaned upon request.

J. P. HALL - - - - Editor
P. O. Box 1103, Sacramento, California.

Vol. 4 JULY, 1927. No. 7

CALIFORNIA HIGHWAY DEPARTMENT

C. C. YOUNG, Governor.

B. B. MEEK, Director of Public Works.

CALIFORNIA HIGHWAY COMMISSION
RALPH W. BULL, Chairman, Eureka
J. P. BAUMGARTNER, Commissioner, Santa Ana
M. B. HARRIS, Commissioner, Fresno

R. M. MORTON, State Highway Engineer, Sacramento

HARRY A. ENCELL, Attorney, San Francisco
E. FORREST MITCHELL, Secretary and Disbursing Officer

HEADQUARTERS STAFF, SACRAMENTO
T. E. STANTON, Assistant State Highway Engineer
L. V. CAMPBELL, Office Engineer

FRED J. GRUMM, Engineer of Surveys and Plans
CHAS. E. ANDREW, Bridge Engineer
C. S. POPE, Construction Engineer
R. H. STALNAKER, Equipment Engineer
T. H. DENNIS, Acting Maintenance Engineer
C. L. McKESSON, Materials and Research Engineer

WILLIAM SCHLEIP, Principal Accountant
BEN H. MILLIKEN, Superintendent of Prison Road Camps

DIVISION ENGINEERS
T. A. BEDFORD, Division I, Willits
H. S. COMLY, Division II, Redding
F. W. HASELWOOD, Division III, Sacramento
J. H. SKEGGS, Division IV, San Francisco
L. H. GIBSON, Division V, San Luis Obispo
E. E. WALLACE (Acting), Division VI, Fresno
S. V. CORTELYOU, Division VII, Los Angeles
E. Q. SULLIVAN, Division VIII, San Bernardino
F. G. SOMNER, Division IX, Bishop
R. E. PIERCE (Acting), Division X, Sacramento

General Headquarters, Third Floor, Strub Bldg., Eleventh and P Streets, Sacramento, California.

EVERY employee of the highway commission has a direct interest in the improvement of the highway organization's methods and results, both engineering and clerical, office and field. To that end, the State Highway Engineer invites constructive criticism or suggestions from every employee.

Ideas as to the more economical and efficient handling of your job, or suggestions for elimination of waste will be welcomed. Criticism is also desired from persons outside the organization, who are in a position to give facts.

Send only signed communications addressed as follows: California Highways, P. O. Box 1103, Sacramento, Cal.

LAST FALL there was accumulated information from the divisions as to the estimated cost of various special projects, which data finally took shape in the Governor's budget passed by the legislature in the spring of this year. The state highway expenditures for maintenance and reconstruction in the biennium from July 1, 1927, to June 30, 1929, will be conducted on a budget basis.

This budget anticipates the revenue and lays out a complete scheme for its expenditure, divided into such detail that little elasticity can be permitted in the initiating of projects not included. The cost of projects can not be materially increased over the preliminary estimates submitted by the divisions last fall, without the direct approval of the Highway Commission and Board of Control to budget modifications, which it is presumed will be based only on emergency conditions.

In many cases the cost estimates as printed for use by the legislature are somewhat higher than those submitted by the divisions. In such cases the divisions should use their original estimates in getting out detail plans. Savings accumulated will be rebudgeted at a later date.

Experience gained under the budget procedure during the present biennium will be profitable in preparing succeeding budgets. It can not be expected that all details will work out perfectly, for no precedent existed for the preparation of the present budget. The divisions, however, should form the habit of accurately analyzing future requirements as to cost and order of importance. This will simplify preparation of future budgets.

Full cooperation of all those in authority is needed to make the budget work smoothly and successfully.

ARGENTINA LOOKS TO CALIFORNIA.

Acknowledging receipt of a copy of the Fifth Biennial Report of the California Highway Commission, Carlos G. Gerstrom, County Engineer for Tres Arroyos, Argentina, South America, writes that in his opinion his country should "follow the wonderful California trends towards highway construction."

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JULY 1927

California Highways

VOL. 4 NO. 7

What Reorganization Means to the Highway Department

ON JULY 29th Governor Young's Reorganization Act, which was Assembly Bill No. 1119, introduced by Mr. Feigenbaum, became law, changing the powers of the California Highway Commission, and reorganizing the activity as a part of the newly created Department of Public Works, to be known as the Division of Highways. The new law directs the Director of Public Works to organize the department, with the approval of the Governor, in such manner as shall be deemed necessary to properly segregate and conduct its work.

The Chief of the Division of Highways shall be designated the State Highway Engineer.

The Director of Public Works is given the power, with the approval of the Givernor, to create other divisions and subdivisions of the department, and may change or abolish same from time to time, with the Governor's approval.

Heretofore the entire Highway Department has been designated as the "California Highway Commission." The name "California Highway Commission" will now mean only the commission, to consist of five members. They are appointed by and hold office at the pleasure of the Governor. Heretofore they have received a salary of $3,600 per year, but under the new law are to receive only traveling expenses incurred in the discharge of their duties. The Governor is vested with the power of naming a chairman of the commission, and with the filling of all vacancies on same.

Under the new law the commission is granted the power to change or abandon any highway route or portion thereof; to relinquish portions of existing state highways, and shall have under its jurisdiction the institution of condemnation suits. Except as may be otherwise provided by law the commission shall have power to conduct preliminary surveys to determine the advisability of the inclusion of new routes in the state system, to select new routes for state highways, to allocate moneys for construction or repair of portions of the state highway and to determine in each case the maximum sum of money that shall be made available therefor. In case of surveys for routes not in the state system the commission is limited to expending not more than one-half of the total cost of the survey.

Except as otherwise provided in the Reorganization Act the new Department of Public Works shall assume all the powers, duties and responsibilities heretofore vested in the California Highway Commission and all its employees and officers. All positions in the former highway organization except as otherwise provided in the new law are abolished, but all the laws pertaining to same continue in force.

PUNCTURE VINE CONTROL ON THE STATE HIGHWAYS

Reported by W. E. GLENDENNING, State Highway Arboriculturist.

THE DIVISION OF HIGHWAYS is getting very satisfactory results in its efforts to control and check the growth of puncture vine on the state highways. This work is now being done under the supervision of W. E. Glendenning, State Highway Arboriculturist.

For several months past he has centered his attention in the central and southern parts of the state, especially in Divisions VI and VIII, where the vine is most prevalent; and now states that for the first time in the history of the fight for eradication, the San Joaquin Valley highway right of way is entirely cleaned of the pest. Outstanding results have been obtained in Imperial Valley, this year's growth running but 10 per cent of that of last year.

The spraying solution used to kill the vine is composed of equal parts of water and stove distillate, every 100 gallons being thickened with 3 gallons of crank-case oil. While being applied it is continually stirred by an agitator within the tank. The water assists the penetration process. Removing the vine by hoeing says Mr. Glendenning, is not effective and only scatters the seed for the following year's growth.

The State Agricultural Department is now experimenting with the seed taken from the vines treated last year to determine if the solution used by the Highway Department has destroyed germination.

COMMISSIONERS INSPECT HIGHWAY LATERALS No. 28 AND No. 29

FOLLOWING THE meeting of the Highway Commissioners at Sacramento on July 7th an inspection trip was made of the Red Bluff-Susanville and Redding-Alturas laterals of the State Highway System.

Improvements desired by the communities served and those contemplated by the Engineering Department were considered and the entire length of both routes inspected. The Commission's party attended gatherings at Drakesbad, near Mount Lassen, at Susanville, also a meeting of the Sacramento Regional Citizens Council, Inc., at Susanville, at Adin, Alturas, Lakeview, Oregon and Cedarville. The county road connection with the Oregon line leading to Lakeview was also inspected. The abundant hospitality exhibited everywhere was highly appreciated by the party.

CHILE FOLLOWING CALIFORNIA STATE HIGHWAY CONSTRUCTION.

"California Highways" is in receipt of a letter from the Automobile Association of Valparaiso asking to receive two copies monthly, stating that their organization is very much interested in California highway construction as conditions in the central Chile zone are practically the same as in California.

B. B. MEEK, DIRECTOR OF PUBLIC WORKS

ON JULY 29th, the effective date of Assembly Bill No. 1119, one of the reorganization measures, the State Highway organization became a division of the Department of Public Works. Other divisions include the Division of Engineering and Irrigation, Division of Architecture, Division of Water Rights, and Division of Ports. Mr. B. B. Meek of Oroville assumes charge of the new department as Director.

Mr. Meek has been for many years closely identified with the olive growing and packing interests of California. His holdings in Butte County are extensive, and although still a young man, he has established an enviable reputation as a successful business man. In his early days he was identified as an engineer with the construction of the Western Pacific Railroad. This experience stands him in good stead in the management of a department, the work of which is largely engineering and construction.

Mr. Meek has seen state service as a member of the state legislature during the session of 1915, and also as a member of the State Board of Prison Directors for practically ten years.

Governor Young's desire to have for the Director of Public Works, a successful business man, mature in judgment, of proven executive ability, and yet one who would bring to the work the vigor of youth, is fully exemplified in his selection of Mr. Meek, and his consent to serve the state is gratifying to all. The Governor and the department are to be congratulated upon this excellent appointment.

COOPERATION IN HIGHWAY BUILDING.

Highway construction in California offers a wide field for cooperation. Daily the California Highway Commission is confronted with situations in which counties, cities, road improvement and joint highway districts, corporations and individuals, can greatly aid their respective communities to secure adequate and permanent highway improvement by proper cooperation with the state.

Our front page illustration for this issue is an excellent example of cooperative result obtained by Los Angeles County, a local road improvement district and the Highway Commission. The practice of cooperative highway building has brought many improvements to the south, which could not have been otherwise obtained.

Besides in actual construction there are many other ways in which state highway development can be aided and hastened by proper cooperation. Those communities willing to cooperate place themselves in most advantageous positions for securing more immediate highway development.

COMMENT

In order to be on time at a recent meeting of the Highway Commissioners in Lake County one of her largest landowners used an airplane from Oakland. His necessity for highways might be questioned.

Kern County finds investment in state highway bonds advantageous for her surplus funds. She has recently added to her already large holdings of this security.

When the public thinks in terms of "cheap prices," rather than safety, durability, permanency and less future cost, in construction—it is as great a mistake as to choose a doctor, or lawyer, on the same basis. Are you inviting disaster or requiring qualification?—Tri-State Constructor.

INVESTIGATION IN UP-HILL AND DOWN-HILL TRAFFIC

By Earl Withycombe, Assistant Construction Engineer.

OUR INVESTIGATIONS of speed of traffic around curves on grades of six per cent indicate that little or no difference is found in automobile traffic traveling either up or down grade or on either inside or outside of curves. Truck traffic travels considerably faster on the inside of curves both up and down grade, but most noticeably on the down grade sections.

Our observations were taken at San Juan grade, Division V SB-2A, Conejo grade, Division VII Ven-2B and Chalk Hill grade, Division VII LA-2B. Average automobile traffic moved up grade at the rate of 21.4 miles per hour on the outside of curves and 23.6 miles on the inside. Down grade the average was 22.2 miles on the inside and 23.0 miles on the outside of curves. Average truck traffic moved up grade at the rate of 9.3 miles on the inside and 8.0 miles on the outside of curves. Down grade they averaged 16.2 miles on the inside and 11.4 miles on the outside of curves.

As nearly as possible similar conditions were selected in each case. Radius of curves ranged from 120 to 275 feet. Central angle ranging from 60 to 160 degrees per cent of grade was uniformly 6 per cent. Super-elevation was from ¾" to 1¼" per foot of width. Pavement in two cases was 20-foot width of bare concrete and in one case 15-foot width of bare concrete with a 3-foot bituminous macadam shoulder on the inside of curve.

TIRE WEAR.

Following extended tests made by the Washington State College, Kansas State Agricultural College and others to determine the amounts of tire wear on the different types of highway it was found that a mile of pavement which carries 1000 cars per day, wears out $1,000 worth of tires in a year, while a mile of gravel road with the same traffic wears out $3,800 worth. The saving on tire wear alone would pay the interest on the cost of paving, where traffic exceeds 1000 cars per day.

A COMPLETED CONTRACT.

"How's this?" asked the lawyer of the contractor. "You've named six material dealers in your will to be your pallbearers. Would you not rather choose some of your friends with whom you are on better terms?"

"No, Judge, that's all right. Those fellows have carried me so long that they might as well finish the job."

AN OLD HABIT.

The story now is that the Scotch gawfer learned to keep his eye on the ball originally when some one told him that there were two or three strange persons playing around the course.—Detroit News.

THE HIGHWAY ENGINEER'S CREED.

I believe that transportation is the keystone of the structure of civilization which is built of school, and church, and court, and market place upon the twin foundations of the home and productive industry.

I believe that highway transportation is a necessary and integral part of this connecting stone in civilization's arch and is coequal with other forms of transportation in sustaining the structure.

I believe that my mission, as a highway engineer, is to assist in shaping and improving the highways of my country, in harmony with those who provide the vehicles which are their necessary complement, to the end that, joined with other means of transportation, they may meet the need of our people for easy, quick and untrammelled transportation.—Public Roads.

Gratifying Results Obtained in Oiling State Roads

AFTER THE OILING TREATMENT.—*Left,* showing highways just after the oil process has been completed, but before opening to traffic; *Right,* shows the same highway compacted by several weeks of traffic.

ONE OF the outstanding developments in California highway maintenance this year is the successful treatment of gravel and rock-surfaced highways with oil which will result in tremendous savings in maintenance, solve the acute dust problem, conserve materials, and provide a smooth, well-compacted wearing surface free from corrugations.

California has a large mileage of secondary type roads, improved during recent years. With the rapid increase in traffic a real problem in maintenance and dust control on these roads has faced the state highway organization. In some instances the loss of material has been as high as an inch annually, representing a loss of from $500 to $1,000 per mile. The dust problem has also become an acute one, having resulted in several instances in severe accidents, because of inability of the drivers to see through the clouds of dust.

A number of experiments have been made to solve this dust problem and conserve the road materials, but none has shown promise of success of the present system of oiling. Up to a recent date there was a total of 374 miles of highway oiled since April 1st at a cost of $510,000. On several sections extra amounts of road materials were used adding at least two inches to the thickness of the road and providing a smooth surface that will last until funds for paving are available.

The comments concerning road results obtained and the manner in which the traffic was handled over roads being oiled reflect considerable credit upon the department. Early in the spring the Maintenance Department formulated a set of rules for its employees, as well as notices requesting cooperation from the traveling public. All employees handling oiling jobs were impressed with the importance of reducing the inconveniences to autoists and judging from reports from various sources success attained their efforts. Two automobile associations of the state have stated that they have this season received very few complaints and that the department is to be congratulated upon working out a plan that has reduced motoring inconveniences to the minimum.

How The Smooth Finish Is Obtained.

Getting that smooth finish on an oiled highway has become a real science with California highway workers and with the "mixing" method it takes three days of constant working to secure the best results. Immediately after the mix has been "laid down" a 7-foot grader drawn by a small tractor begins working the road behind the traffic for the purpose of keeping the surface smooth during compaction. When traffic first moves over the finished roadway a light car will sink into the surface as much as in inch. Within three hours the same makes no impression and in three days a 22,000-pound load will leave only faint marks which are quickly ironed out by following traffic. The blade is kept steadily working until no further material can be moved, this stage usually being reached about the third day. For this work it is desirable that a rubber-tired tractor be used to avoid cutting up the surface.

Vialog tests on Division VIII oiled highway demonstrated it to be smoother than any type of road in the California highway system and this includes cement concrete, asphaltic concrete and bituminous macadam, and after nine months' service no wear is apparent.

Costs Reduced.

Using the same force of men at the oiling this season that "learned the game" last year has enabled a number of the divisions to not only attain a more satisfactory finished roadway but to do the work at a lesser cost. In Division VIII oiled highways cost $1,600 per mile last year but this year better results were obtained for $1,025.

CIRCUMSTANTIAL.

"Why are you divorcing your husband?"

"Well, the other night he was reading the paper and I slipped up and kissed him on his bald spot—"

"Yes?"

"And he said, 'Quit playing, honey, and get out those letters I dictated yesterday.'"—Life.

Mountain Springs Grade Has New Construction Features

MOUNTAIN SPRINGS GRADE.—(1) A few years ago, a narrow roadway with many sharp curves. (2) Drilling the rock for blasting ahead of the gas shovel. (3) Laying the concrete pavement in half width. (4) The complete pavement showing curb on the outside of curve. (5) New pavement winds its way down a canyon on the side of a mountain of huge boulders.

Reported by S. V. Cortelyou, Division Engineer, Division VII.

THE MOUNTAIN Springs Grade paving project, completed in June, 1927, is built to the highest standards of the California Highway Commission. Constructed through solid rock in a difficult location, it is ranked by the engineers as one of the outstanding jobs of the year. The new highway extends from the Myers Creek bridge in Imperial County to the top of Mountain Springs grade in San Diego County, a distance of 6.8 miles. It is near Jacumba, a resort at the top of the grade, about 60 miles from El Centro.

The Jahn & Bressi Construction Company, Inc., were the contractors, and began work in February, 1927. The paving is of Portland cement concrete, 20 feet wide, laid in two 10-foot strips, each 6 inches thick at the center and 9 inches at the edges. Considerable drilling and blasting was done ahead of the subgrade shaping, to widen the roadway and improve the alignment. Making subgrade in the rock was very expensive, and the total cost of the job was $416,255. W. D. Eaton was resident engineer.

Originally the road was a narrow grade, constructed by the two counties by public subscription. After being taken into the State Highway System the easterly 5 miles was widened in 1920 under a day labor authorization. The westerly 1.8 miles was widened in 1926.

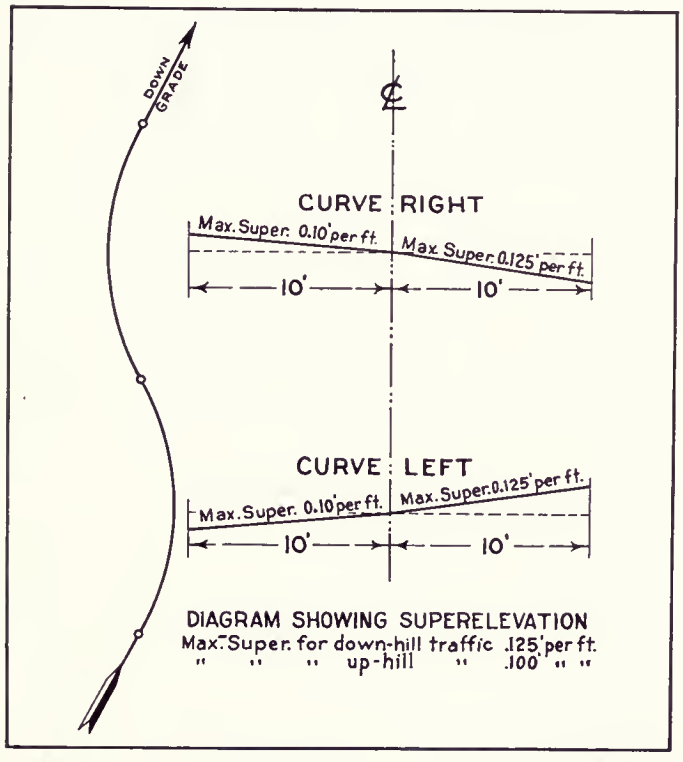
Construction Features.

Owing to maximum grades of 7.12 per cent, and curves with radii as sharp as 140 feet, the matter of super-elevation was given considerable study. Much of the traffic over this road is heavy trucking from Imperial Valley to San Diego, with slow up-hill and fast down-hill speed, and to care for this condition a compromise super-elevation was adopted. Each one-half of the pavement was designed with different super-elevations suitable for the unusual difference of speed. Had the maximum super-elevation been used of 2½ feet in the full 20-foot width, there would have been danger of the heavy trucks with high loads over-turning or sliding to the low side of the pavement.

Results obtained in the riding qualities of the finished pavement justify the type of construction adopted. In spite of the steep grades and sharp curves motorists can drive with safety in either traffic lane.

Another feature worked out successfully in this job is a combination curb and guard rail. By thickening the curb and constructing it a few inches higher than the customary standard it served both purposes.

Two views of the completed Mountain Springs grade paving which shows change in the angle of super-elevation at the center of the roadway.



MOUNTAIN SPRINGS SUPER-ELEVATION.—Plans for Mountain Springs grade paving showing variation in super-elevation at center of paving.

NO INCENTIVE.

Employer—Sam, I hear you and George almost had a fight.

Sam—Yessah, boss, we-all would 'a' had a terrible fracas, only dey wasn't nobody dere to hold us apart.

OVER 200,000 YDS. OF EARTH MOVED IN CARQUINEZ APPROACH

WHILE THE erection of the main cantilever spans of the Carquinez bridge was an outstanding engineering feat, the building of the south approach to this crossing by the California Highway Commission was no less spectacular.

Excavation of 207,000 cubic yards was necessary in building the 1.8 miles. The largest cut made was 500 feet long, and 106 feet deep, with a yardage of 83,000.

Under the requirements of the contract, dirt was spread in one-foot layers and then rolled to allow immediate use without disastrous settlement or sliding.

HIGHWAY TRAVEL IN COLONIAL DAYS.

In these days of rapid transportation by airplane, railroad, and automobiles, it is hard to realize that only a little over 100 years ago the difficulty of traveling only a short distance was very great. A very few of the wealthier people owned coaches, but a coach could never make over three miles an hour, and often only two.

It was actually urged as a serious objection to the adoption of the Constitution, that many of the people would be more than 300 miles from the seat of government. Of course, the members of Congress were obliged to attend, but HOW to get there was often a serious question. The few who could come by stage or coach often arrived weary and spattered with mud, as it was a common thing for them to be obliged to get out and help pry the wheels out of the mud. The most of them came riding horseback. Andrew Jackson came in this way over mountains, through dense woods, fording rivers and creeks, 800 miles from Tennessee.

The country roads were often nothing more than trails or bridle paths. It was easy to make a wrong turn and wander for hours in the thick woods.—Georgia Highways.

Such is Fame.

Several years ago, Firestone, Ford, Edison and Burroughs were touring through West Virginia. A light on their car went bad and they stopped at a little cross-roads store in the Buckingham section. Henry Ford went into the store to make the purchase.

"What kind of automobile globes do you have?"

"Edison," replied the merchant.

"I'll take one," said Ford, "and you may be interested to know that Mr. Edison is out in my car."

"So?" said the merchant.

When the light was put in it was found that a new tire was needed, so Ford went back to the store and asked what kind of tires the merchant had.

"Firestone," was the reply.

"By the way, you may be interested to know that Mr. Firestone is out in my car, and that I am Mr. Ford—Henry Ford."

"So?" said the merchant, and let drive a long squirt of tobacco against the wall.

While the merchant was putting on the tire, Burroughs, who had white whiskers, leaned out of the car and said, "Good morning, sir."

The merchant looked up at him with a grin of sarcasm, and said, "If you try to tell me that you are Santa Claus, I'll be damned if I don't crown you with this wrench."

He'd Have the Judge Pay the Fine.

The Accused—I was not going thirty miles an hour—not twenty, not ten; in fact, when the officer came up I was almost at a standstill!

The Magistrate—Oh, well, I must stop this or you'll be backing into something. Ten dollars!—Tatler.

Fair Warning.

In a certain province liable to floods there is a notice on a low-lying road which reads:

"When this notice is under water this road is impassable!"—The Nation's Highways.

Redwood Highway Job Progressing Under Difficulties

ONE OF the largest California state highway projects now in progress is the construction of 14.9 miles of the Redwood highway in Humboldt County, from Orick to the northerly boundary.

The clearing of the right of way was made a separate contract and was awarded to the Englehart Paving Company of Eureka for $54,600. This part of the work, necessitated the removal of over 20,000,000 feet of timber and a great deal of undergrowth and trunks of fallen trees and was started two months prior to the grading.

View of heavy excavation being done on Redwood highway contract, north of Orick, Humboldt County.

The contract for the construction which will be rock surfaced, was awarded in two sections: A, 8.2 miles, to W. H. Hauser of Oakland for $198,071.55 and B, 6.7 miles, to Englehart Paving Company for $241,737.99. The contract was divided in order to assure the completion of the entire job in one season, or 175 working days. Hauser broke all records in getting his equipment on the job and work started. He loaded his equipment at Oakland, May 22, 1927, shipped over the Northwestern Pacific Railroad 320 miles to Trinidad, then transported 24 miles over mountain road to Orick. One shovel was moved on a trailer hauled by truck and tractor, the other under its own power. He started work on June 1st.

Englehart has begun grading work on Section B. The total allotment set up for the work, including clearing will be $572,749.94. This is a Federal Aid job.

Closing the Gaps

By THOS. H. MACDONALD,
Chief of the U. S. Bureau of Public Roads.

Approximately 26,000 miles is the estimate of the roads to be constructed this year under the supervision of the state highway departments. Probably more than 21,000 miles will be on the Federal-aid highway system, and somewhat less than half of this improvement will be carried on with Federal aid. The year's addition to the Federal-aid system will bring the mileage of that system initially improved up to practically 150,000 miles, leaving only 35,000 miles of the roads thus far designated to be constructed in order to complete the initial improvement of the system.

More rapidly than most of us realize the main highway system of the United States is being brought to a condition of continuous improvement. We are still a long way from the condition that will ultimately be required but we are moving toward it at a surprisingly rapid rate. Roads we are now improving with gravel and other low-type surfaces will eventually have to be further improved. Narrow present surfaces will need widening; bridges which suffice for the present will need replacement; grade crossings tolerated in the initial improvement must be later eliminated; and the whole system as originally constructed must be combed over to root out of it the danger places, the congestion breeders, and the failures of one sort or another inevitable in a construction work of such magnitude. These are refining processes and they will continue indefinitely; but the fact remains that we are now rapidly approaching the time when we shall have a continuous net-work of main state and interstate arteries improved throughout to some degree at least, and all of it under maintenance by the state highway departments.—The Highway Magazine.

POSTPONEMENT PAYS.

Sparks—"If you know who stole your car, why don't you go get it back?"

Larks—"I'm waiting for him to paint it."—Life.

DELAY RUNS INTO MONEY

Whatever slows transportation in these modern days costs everybody money. This is a fact not understood with sufficient clearness by the roadmakers.

Some striking estimates have been made by the Albert Russell Erskine Bureau for Traffic Research conducted in Harvard University. Traffic congestion costs New York City upwards of $200,000,000 a year. If Chicago could cut its traffic congestion delays by 10 per cent, the saving would be not less than $27,000,000 a year.

The loss is more than the cost of gasoline burned in running motors that do not move their cars. The adoption of motor transport enormously has increased the item of "cartage" which is charged against almost every article used by the people. Transport is the blood circulation of business and congestion and delay are temporary commercial paralysis.

The worst obstructions in the great trunk line channels of motor transportation are village main streets. It is absurd to spend millions of dollars to secure facilities for rapid transportation and still permit these great roads to become impassable at faster than horse-and-wagon speed at intervals of five or six miles. The future plan of surveying for main trunk highways will avoid the ancient, narrow, obstructed village high streets and the frequent cross roads that now have to be guarded with intermittent lights that bring all traffic to standstill at intervals of a few seconds. The world is moving too fast for such delays.—Detroit News.

Feminine Safety.

Motorcycle Policeman: "You were going 45 miles an hour. I'll have to pinch you."

Sweet Young Motorist: "Oh, if you must, sir, do it where it won't show."

So Sudden.

Johnny, ten years old, applied for a job as grocery boy for the summer. The grocer wanted a serious-minded youth, so he put Johnny to a little test.

"Well, my boy, what would you do with a million dollars?" he asked.

"Oh, gee, I don't know—I wasn't expecting so much at the start."—Goblin.

HIGHWAYS AND THE MISSISSIPPI FLOOD

"It is impossible at this time to prophesy," says "Good Roads" in June issue, "how much damage has been done to the roads in Arkansas, Illinois, Louisiana, Mississippi, Missouri and Tennessee, as result of the Mississippi River flood, but it is safe to say that the loss will be large and when the waters subside extensive repairs will be necessary. Some roads will undoubtedly have to be entirely rebuilt and the opportunity for improved design through relocation and elimination of curves and turns will be large. Also evidence will be forthcoming as to the behavior of various types of material under such conditions and we shall undoubtedly hear much from many trade associations along these lines in the months to come.

The South has suffered a mighty disaster, but it will come through, and in the rebuilding of its economic and material structure new and improved highways, replacing those destroyed and lost by the floods, will play a large part in the reconstruction work. It is to be hoped that engineers of the flooded states will plan for the future and not for the immediate present. By so doing they will make possible a bigger and better South.

Over 1200 miles of improved highways have been rendered useless, not to mention thousands of miles of secondary roads that are unavailable for highway transportation, the result of the Mississippi flood."

When Noah sailed the ocean blue,
He had his troubles same as you;
For days and days he drove the ark,
Before he found a place to park.

—Florida Highways.

"CALIFORNIA HIGHWAYS."

An engineering authority of one of the leading road material organizations of the United States writes the following of "California Highways": "Of the many highway commission publications which we receive, I believe that this one contains more real meat in each issue than any other. We look forward to receiving this each month with a great deal of interest."

AUSTRALIAN EXPERT HERE.

E. F. Stevens, a road expert of Australia, recently paid different departments of the Division of Highways a visit, investigating highway building, stating that he was anxious to get the advice of a state that has passed the experimental stage of highway building.

COMMISSION COMPLIMENTED ON SAN BERNARDINO JOB.

The San Bernardino Chamber of Commerce has written the Highway Commission expressing appreciation of the "Splendid way in which the Waterman Canyon highway and switch-backs to the top of the mountains are being cared for and maintained." This road accommodates thousands of autoists each week-end.

EXPERIMENT IN METHOD OF SPREADING ASPHALTIC CONCRETE

Upper, Rake used in mixing asphalt; *Lower,* Smoother surface obtained with strike-off templet.

(By the Construction Department.)

Experiments are now being carried on by the Construction Department, with the cooperation of various contractors, to devise means of spreading asphaltic concrete mechanically to eliminate the uncertainty and expense of hand work. The device giving most promise consists of a tooth scarifier followed by a strike-off templet. Results obtained on Contract M-161, Merced-4-A, justify further experiments and it is now planned to combine the rake and templet with a tamper.

Further experiments along this line will be watched with interest by the department and interested highway builders.

A SAD TALE.

The traffic cop he did not heed
But raced ahead, pell-mell,
So the doctor told the sexton
And the sexton tolled the bell.

Highway Mathematics.

Professor: "Define the word 'detour' as used on highways."
Student: "A detour is the roughest distance between two points."

Choice of Fuel.

"What, according to your view, is the burning question of the day?"
"Shall I eat or buy gasoline?"—Florida Times-Union.

TWO TYPES OF GUARD RAIL USED ON YOSEMITE HIGHWAY

GUARD RAIL—*Upper,* Stone parapet on Yosemite highway; *Lower,* Guard rail of natural logs on Yosemite highway.

(Reported by Division VI.)

TWO TYPES of guards are being used on the Yosemite highway. Stone parapets and retaining walls were built during the construction of the road, and some natural log rails have been built during the past month, both by convict labor. Both parapets and rails blend well with the rugged country through which the road passes.

The natural log rail, besides adding beauty to the highway, is of economical and substantial construction. Trees cleared from the right of way in many districts are successfully utilized for this purpose.

COST OF POOR ROADS

An automotive engineer found that in one year the average automobile consumption of gasoline in North Carolina was reduced, by improved roads, from 521 to 454 gallons. That made a saving of $16.76 per car.

Fuel, however, is only one of the various factors involved. The poor road wears out the whole car faster than the good road. The expense thus caused is far higher than most owners suspect.

An automobile dealer in Illinois, who carefully checked up the expense of operating on paved roads and dirt roads, found that the motorists saved, on an average, 2.4 cents a mile on the hard-surfaced highways. Another investigator put the saving a little higher. The average may be 2.5 cents a mile Motor trucks may save as much as 5 cents a mile on good paved roads as against unimproved roads.

This is many times as much as any motorist or trucker pays in the form of road taxes on gasoline or otherwise.

HIGHWAY ACCIDENTS

A survey made recently shows that 100,000 persons have been killed and 3,000,000 injured in highway accidents during the last five years—one casualty every forty-two seconds—and that 30,000 of those killed have been children.

Highway and city engineers are endeavoring to make accidents difficult by widening roads and streets, eliminating grade crossings, removing blind and dangerous curves, but they need public support.—Concrete Highways and Public Improvements.

GAS TAX IS SCIENTIFIC TOLL

The gasoline tax is by far the most scientific impost upon motor vehicles. It meters highway service and the benefits received from the use of highways. It approximates toll-gate results without the infirmities of toll-gate procedure. The consumption of gasoline varies with the weight, speed and mileage of the motor vehicle. No other factor in the car's domestic economy reflects so closely the benefits received from highway use.—Nation's Highways.

A. S. C. E. Will Meet in Columbus.

The American Society of Civil Engineers will hold its fall convention in Columbus, beginning Wednesday, October 12th, to Saturday, October 15th, inclusive. This convention will bring together many well-known civil engineers of the United States and foreign countries.

The American Society of Civil Engineers is the oldest national engineering organization, having been founded in 1852.

The chief topics for discussion at this meeting will be sanitary engineering and the Mississippi flood protection problem. An effort is being made to schedule a meeting of the highway section of the society in connection with this convention.

Oregon Dam To Set New Record.

Problems surrounding the projected construction of three new irrigation dams, one of which will be the highest dam in the world, will be studied by a board of consulting engineers, appointed by the Secretary of the Interior, the Department of the Interior stated on August 1st.

The board will report to the department upon "various matters in connection with the design and construction" of the dam. The three construction projects are the Owyhee dam in Oregon, which will have a total height of 360 feet, 11 feet higher than Arrowrock, the world's highest existing dam; the Deadwood dam in Idaho and the Gibson dam in Montana.

According to the Freshman Intelligence Test.

An oxygen is an eight-sided figure.
Nero means absolutely nothing.
Homer is a type of pigeon.
Ulysses S. Grant was a tract of land upon which several battles of the Civil War were fought.
A quorum is a place to keep fish.
A vegetarian is a horse doctor.
Radium is a new kind of silk.
Henry Clay is a mud treatment for the face.
Mussolini is a patent medicine.
Flora and Fauna are a couple of chorus girls.—Western Reserve Red Cat.

Concrete Roads.

No type of pavement surface has shown the tremendous increase that concrete has. Practically unknown except to a very small part of the population in 1909, it is now so much a part of every community that "hard roads" and "concrete" have become synonymous.

A Billion Dollars Spent to Improve Highways

Announcement by the United States Bureau of Public Roads that more than 4000 miles of roads included in the Federal-aid highway system have been completed since the beginning of the current fiscal year serves to focus attention on the progress which has been made on the program thus far.

Construction during the fiscal year ending June 30, 1927, was begun on 14,580 miles of roads embodied in this state and federal cooperative building scheme. When this addition has been completed, approximately 70,000 miles of this nation-wide network will have been laid down with the aid of federal funds.

It is appropriate to take account of stock regarding the Federal-aid highway system at the present time, since this year marks the tenth anniversary of the start of this plan for stimulating road building in the United States with an especial view to providing better highways in those states whose resources and income were inadequate to performing the task alone.

The Federal-aid system was launched in 1917 and since its initiation has involved the expenditure of more than one billion dollars. The total outlay to July 1, 1926, was $966,692,834.36. Of this sum the Federal Government contributed $426,178,703.58. The mileage which this amount made possible totaled 52,526. The first largest units built during this period were 4920 miles in Texas, 3181 miles in Minnesota, 2193 miles in North Dakota, 2181 miles in South Dakota and 2114 miles in Iowa. Between 1000 and 2000 miles were built in 21 other states.

Projects now under construction call for an estimated expenditure of $365,729,746.36, or approximately one-third the whole sum expended from 1917 to July 1st last. Of this huge total, the Federal Government is scheduled to contribute $151,489,782.13. Nebraska is down for the largest mileage of any state which is to benefit from the projects now under way, the total for this state being 1359 miles. North Dakota is second with 807 miles, Kansas third with 800 miles and New York, which acquired 1197 miles prior to July 1, 1926, is fourth with a total mileage of 665 miles.

Figures indicating mileages completed with the assistance of federal moneys do not, however, tell the whole story of the progress of the Federal-aid system. The entire length of this highway scheme is 182,134 miles, but the fact that about 70,000 miles have been built or are under construction does not mean that less than half the entire system is still on paper.

It is far more than projected and Thomas H. MacDonald, Chief of the Bureau of Public Roads, is authority for the statement that the mileage within the system at present initially improved or in process of improvement is not far from three-quarters of the total. This does not mean that this portion is entirely improved. But it does indicate that the greater part of the foundation work for his great scheme of nation-wide highways has been accomplished.

With comparatively slight exceptions, the roads included in the Federal-aid system are embodied in the state highway systems. Thus it is that a goodly portion of their improvement has been completed without Federal Government participation. In fact, state reports show that the ratio of mileage completed by state highway departments in 1925 was more than double the Federal-aid mileage completed during the fiscal year ended June 30, 1926.

The system will insure the improvement of the main arterial highway of the nation, as may easily be realized when it is borne in mind that the Federal-aid system includes less than 200,000 miles of the total 3,100,000 miles of roads existing throughout the United States.

LOS ANGELES SPENDING $25,000,000 ANNUALLY ON STREET IMPROVEMENTS

An expenditure of approximately $25,000,000 per year is being made by the city of Los Angeles for the improvement of its streets, is the recent statement of C. J. Shultz, who is in charge of the street designing division of the office of the city engineer. He adds that the statistics for last year show that Los Angeles expended upon street improvements two and one-half times as much as the cities of Chicago, New York and Philadelphia combined.

Dizzy Doings On the Desk.

The pencil has made quite a number of pointed remarks about the sponge being soaked all day and the waste basket being full. The scissors are cutting up and the paper weight is trying to hold them down while the paste is sticking around to see the stamps get a good licking. The ink's well, but appears to be blue, while bill is stuck on the file, and the calendar is looking fresh after having a month off. The blotter is lying around taking it all in.—Exchange.

Right to Restrict Truck Loads Upheld.

The right of a state to limit truck loads upon the highways was upheld in a recent decision of the United States Supreme Court, in a case brought against the Oregon Highway Commission by certain trucking companies, attacking the validity of an order reducing load limits on the Columbia highway from 22,000 to 16,500 pounds.

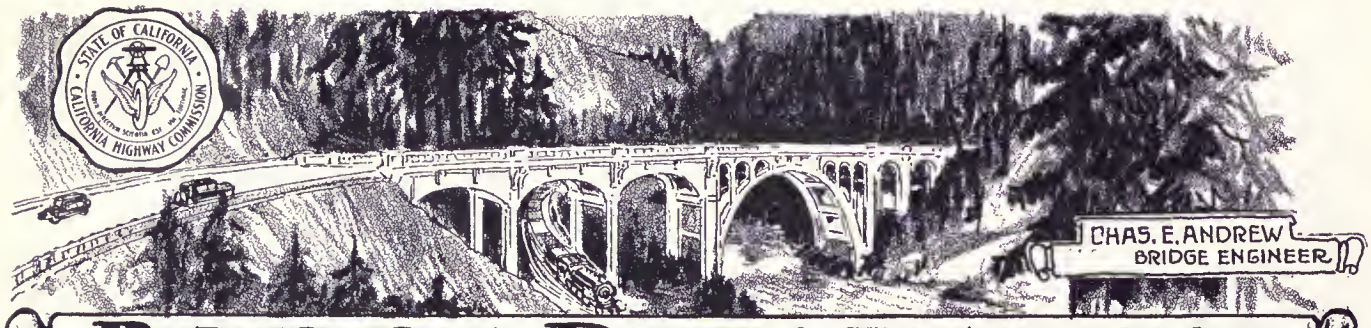
NOTES.

Wynn Meredith, a former resident engineer for the California Highway at Eureka, has joined the engineering staff of the Englehart Paving Company. He has gone to Merced County where his company is constructing 20 miles of roadbed for a railroad.

Ray A. Klein has been reappointed chief engineer for the Oregon Highway Commission.

Highway Construction Over Radio.

In the radio program announced for August, by Texas A. & M. College, College Station, the theme for Monday, August 29, is listed as "Asphalt and Tar Highway Construction," given by S. R. Wright.



BRIDGE DEPARTMENT

BRIDGE SURVEY

By C. E. Andrew, Bridge Engineer.

ON MAY 11th, the Highway Commission directed the State Highway Engineer to investigate and report on all bridges on the State Highway System, regarding their load-bearing capacity and general physical condition, etc., and to post with adequate warning signs those bridges found to be in a weakened condition.

There now exist on the State Highway System over 600 bridges of various types and design. Many of them are in a dangerous condition structurally. Others are depreciating so rapidly that they will soon be dangerous, while still others will be safe for ordinarily heavy loads for many years if they are not overstressed.

Most of the bridges were built by counties prior to the organization of the State Highway Commission. When built many of them were considered high-class structures, measured in terms of the then existing traffic. Depreciation is so general that it is wise to take stock of their present condition.

The state has millions of dollars invested in its bridges, but the Highway Division has only casual knowledge of their condition. Very few states in the Union have ever attempted to keep what might be termed a bridge inventory. There has been a tendency to consider a bridge as everlasting. The Bridge Department considers the proper prosecution of the bridge survey as one of its most important immediate functions.

The completed survey will serve many purposes. It will establish the load capacity of all bridges. A load capacity will be established for continuous traffic which may be hauled without permit, and for intermittent loading which may be permitted occasionally under special permit.

The study will include determination of traffic-carrying capacity, width of roadway and condition and alignment of approaches. Bridges will be classified as to their adequacy and safety under existing traffic, and under the increase which may occur during their useful life.

The report will be valuable to the designing and maintenance departments, in that it will furnish data on many different types of materials, and forms of construction, particularly bridge floors, paint, types of expansion joints, etc. It should be a guide in determining the entire future bridge construction program, in that it will determine those bridges which require immediate replacement, those which may be adequate for a few years and those which may safely carry the traffic for a number of years.

It will disclose those structures which are immediately dangerous but which may be repaired with a nominal amount of expense and made adequate for the immediate future. Many bridges are now posted with low-limiting load signs which with a comparatively small amount of money may be strong enough to justify increasing the load limit.

There are no doubt many bridges now existing which should have repairs not apparent upon superficial examination, but which will be discovered by expert examination. By such examination the proverbial "stitch in time" may save expense in the future.

Such an examination to be of real value must be made as thoroughly and rapidly as possible, and when once made must be kept up to date by men who are thoroughly familiar with bridge construction and design.

The Bridge Department has assigned two of its experienced assistant bridge engineers to the task—one to the southern and one to the northern part of the state.

In making such a survey California will have made a step in advance and one which is in line with the policy of the large railroads and other big business corporations, which seek to preserve as far as possible their enormous investments in equipment and property.

It is planned to examine first those structures which are known to be dangerous and which are now posted for low-limiting loads, so that the load limit signs now existing may be either revised or eliminated.

BRIDGE DEPARTMENT NEWS

Frederickson and Watson of Oakland were awarded the contract for the construction of the Mossdale subway in San Joaquin County. T. E. Ferneau will be resident engineer in charge.

Mercer-Fraser Company of Eureka were low bidders on the Redwood Creek bridge near Orick in Humboldt County. Albert Lernhart will be in charge of this project.

J. C. Wilson has been assigned as resident engineer for the construction of Rattlesnake Creek bridge in Modoc County. F. A. Maurer & Sons of Eureka were the successful bidders on this project.

Frederick Panhorst, by virtue of his high standing in recent Civil Service Examinations, Grade V Associate Bridge Engineer, has been appointed in the Bridge Depart-

ALL-YEAR HIGHWAY BRIDGES.—Route 18, Merced to Yosemite Valley, popularly known as the All-Year highway, has a number of recently completed bridges of modern design. (1) Bridge across the South Fork of Merced River, built by convict labor. (2) A roadway view of the same bridge. (3) Bear Creek bridge at Briceburg. (4) Concrete arch with stone facing across Sweetwater Creek.

ment. Mr. Panhorst was formerly connected with the bridge department of the Washington State Highway Department and had direct charge of the construction of several large bridge structures for that state, the most important of which is the million-dollar bridge structure recently completed at Everett, Washington. He has had a wide experience in both construction and design of highway and railroad bridges. The Bridge Department is fortunate in acquiring his services.

LOWLY OYSTER SHELL AN ECONOMIC SELF-CEMENTING ROAD MATERIAL

Some of the shell roads of the southern United States are famous the country over. Their compact nature, the almost perfect cementation of the material, the smoothness of the surface and the low cost of maintenance of such roads interest those who have witnessed highways elsewhere in the throes of dissolution, never apparently being able to hold their own, good weather or bad. An increasing number of southern municipalities are turning to the lowly clam and oyster shell as the most suitable material for use on their highways and their city streets after having had rather costly experiences with the usual clay-sand-gravel combination.

In spite of the fact that shells as a means to a suitable material for the making of roads is readily available, work along these lines is still in its infancy. Doubt on the part of taxpayers that the shell road will stand up is common. It is for this reason that most cities that utilize shells as a road material try out a section of road with shells and a like section with gravel. In almost every instance where both have been tried out the shell road has won the approval of the people; the gravel sections of such streets needing constant attention as to blading and replenishing. The shell road needs no blading; the material, once compacted, does not fly out of place as does the loose gravel. Rain instead of affecting the shall road rather hastens cementation of the material, and added rains only make it that much more substantial.—Christian Science Monitor.

WHAT THE DIVISIONS ARE DOING

(Continued on page 15).

DIVISION VIII.

HEADQUARTERS, SAN BERNARDINO.

E. Q. SULLIVAN, DIVISION ENGINEER.

Counties of San Bernardino, Riverside, and Imperial.

New Imperial Highway Completed.

Completion of Contract 520 between Brawley and Westmorland opens a new road diagonally across some of the richest land in the Imperial Valley, and shortens the distance to Los Angeles about two miles. There have been many appreciative comments in the local newspapers on the new road. H. L. Cooper, resident engineer, was in charge of the contract.

Lived in Tent Two Years Awaiting Cottage.

A maintenance foreman's cottage has been completed at Newberry. The Newberry site has been owned by the Highway Commission for several years, and is one of the most beautiful on the desert, being a true oasis where there is plenty of water.

Maintenance Foreman, G. Harp and Mrs. Harp, at Newberry, are rejoicing in their new home. They have lived in tents since May, 1925. Mrs. Harp gave a house-warming party that was greatly enjoyed by residents of the surrounding region.

Oiling Complaints Nil.

Oiling of the gravel road has been completed between Victorville and Daggett, a distance of 45 miles. The road has a fine appearance and the work has been greatly appreciated by the public. Considering the fact that it is difficult to do any great amount of this work without at least some traffic being splashed with oil, the division forces in charge of this work take pride in reporting that not a single complaint was received during the progress of the work.

WHAT THE DIVISIONS ARE DOING

DIVISION III.

HEADQUARTERS, SACRAMENTO.

F. W. HASELWOOD, DIVISION ENGINEER.

Counties of Butte, Colusa, El Dorado, Glenn, Nevada, Placer, southern Plumas, Sierra, Sutter, Yuba, and northern Sacramento and Yolo.

New Type of Construction for Placer Bridge.

Unusual interest is attached to the new type of construction to be used on a reinforced concrete culvert and retaining wings and wall to be built on Blackwood Creek, five miles south of Tahoe City, Pla-38-A. The concrete is to be faced with cobweb rubble masonry which will be a new feature in state bridge construction. The bids for the job were opened in the division office on August 1st, Holdner Construction Company of Sacramento being the low bidder with a bid of $5,630. The engineer's estimate was $6,225.

Draftsman Wins Southern Bride.

John Edgar Stewart, draftsman in Division III office, and Miss Lillian May Wallace of Long Beach were married on July 25th at the home of the bride's parents. The newlyweds will be at home in Sacramento after August 10th.

DIVISION IV.

HEADQUARTERS, SAN FRANCISCO.

JOHN H. SKEGGS, DIVISION ENGINEER.

Counties of San Francisco, Marin, Sonoma, Napa, Contra Costa, Alameda, Santa Clara, Santa Cruz, and San Mateo.

Marin County.

The Pacific States Construction Company has completed its contract M-144 for widening and reconstruction of a portion of the Redwood highway in Marin County through Ross and Larkspur.

The work consisted chiefly of grading and placing water-bound macadam shoulders and leveling course, and surfacing the road with asphalt concrete type "A" surface. The completed roadway presents a marked improvement over the former traveled way. Sharp turns were eliminated and short vertical curves lengthened, resulting in a very much improved alignment, and safer grades. Very little additional right of way was necessary. One desirable construction feature was the elimination of excess crown in the old roadway.

The work has brought many compliments from the local communities.

Contra Costa County.

The Tieslau Brothers' contract for reconstruction in Contra Costa County from Tormey to Valona is rapidly nearing completion. The main effort on this contract centered in completing grading work and placing broken stone surface prior to the dedication services of the Carquinez Straits bridge, on May 21st. The contractors are now placing the concrete grillage and gunite surface on the cut slope between the highway and the Great Western Power Company's Valona substation.

San Mateo "Bottle Neck" Job Progressing.

The Kaiser Paving Company is completing its work of grading and widening on Peninsula in San Mateo County, between Colma and Cypress Lawn Cemetery. The work involved moving of many buildings, as well as reconstructing storm drains and heavy grading.

The moving of the Market Street Railway Company's tracks to the center of the new right of way is under way. It is hoped that this work, and all of the grading, will be completed within the present month, so as to permit the construction of pavement. The contract for the paving has been awarded to Hanrahan Company of San Francisco, and should require not more than 75 days to complete.

This section of state highway has been notoriously known as the Bottleneck, the old pavement being only 24 feet wide. The entire Peninsula highway traffic in and out of San Francisco traverses this road, and on peak days approximately 23,000 vehicles have been counted in a 16-hour period. The new improvement is being constructed wide enough to take care of this traffic.

Alameda County.

Contractor N. M. Ball of Porterville has made a very energetic start on the reconstruction on Route 5 in Alameda County between Dublin and Livermore. Contractor Ball has commenced placing concrete in one-half width, working from the Dublin end. Approximately two miles of one-half width were completed early in July.

Widening the roadway requires considerable grading. Borrow pits and deep side ditches will be filled, and all borrow material is to be secured from outside the right of way. The contract involves a small line change near Livermore which requires the construction of a new bridge across Las Positas Creek. The widening of the Alamo Creek bridge near Dublin and reconstruction of the Tassajero Creek bridge at Santa Rita are also included in the project. The three bridge contracts have been awarded to George J. Ulrich of Modesto. It is planned to have all work completed early in the fall. All through traffic is now detoured between Dublin and Livermore over the county road via Pleasanton, much of which is paved.

Maintenance.

The division maintenance forces have been busy in carrying out an oiling schedule on stone-surfaced roads in various locations. The Pacheco Pass from Gilroy to Merced County has been oiled and is in excellent condition. The oiling has alleviated the dust which has prevailed on this road during previous summers.

All of the Skyline boulevard from San Francisco to La Honda summit is now oiled. The oil surface should prove to be a safer road by the elimination of loose stone.

The oiling forces have also completed the oiling of the broken stone surface roadway in Sonoma County and the approach to the Carquinez bridge in Contra Costa County.

DIVISION V.

HEADQUARTERS, SAN FRANCISCO.

L. H. GIBSON, DIVISION ENGINEER.

Counties of San Benito, Monterey, San Luis Obispo, and Santa Barbara.

San Juan to Hollister Reconstructed.

The reconstruction of the highway from San Juan to Hollister, a distance of 7 miles has just been completed by the Granite Construction Company. This work includes the construction of concrete shoulders and bituminous macadam second story. When bids were called for on this work, alternative bids were secured on constructing the second story work of asphaltic concrete and of bituminous macadam, and the contract was awarded on the basis of the bituminous macadam work. This work constitutes a fine improvement on a lateral route which has a traffic of from 1000 to more than 2000 vehicles per day.

Elwood Overhead Completed.

The grading of a line change at the approaches to the Elwood Overhead Crossing about 12 miles north of Santa Barbara on the Coast Highway, Route 2, has recently been completed by E. Schelling Contractor, and the broken stone surface placed under this contract has been oiled by the state using the mixing method.

30-Foot Concrete Pavement.

The reconstruction of the state highway between Summerland and Carpinteria in the southern part of Santa Barbara

County, is rapidly approaching completion. This is a very heavily traveled highway and the reconstruction includes the building of a 40-foot graded roadbed and a 30-foot concrete pavement. It is expected that the pouring of the concrete pavement will be completed before the middle of August.

Quarry Waste Used For Highway Building.

Approximately 8 miles of the Cholame Lateral has recently been oiled, extending from the end of the concrete pavement approximately 12 miles east of Paso Robles through the town of Shandon. On the first 6 miles of this road Logan quarry waste was placed by the Granite Construction Company, and oiled by the state forces using the Oregon surface method of oiling. On the remaining 2 miles oiling was performed by the mixing method, utilizing the existing roadway surfacing.

Traffic Increasing on Big Sur.

While much of the highway on the Monterey Coast between Carmel and Big Sur receives comparatively little travel, the portion of road from Carmel south to the Highlands Inn, is subject to a maximum travel of more than 1600 vehicles per day, according to recent counts. In order to help maintain the road under this traffic an oil sand mulch one inch thick is being placed over the surface by the maintenance forces.

Cuyama Lateral Work.

When the construction of the Cuyama Lateral between Santa Maria and Bakersfield was completed by the Cuyama Joint Highway District within the past year, considerable portions of the road were left unsurfaced. Nevertheless recent traffic counts indicate a through travel continuously in excess of 200 vehicles per day, where but few vehicles formerly used this route. The splendid work that the state maintenance forces have done in improving the surface condition of this road, undoubtedly has considerable to do with the increased travel on the road. At some points in the Upper Cuyama Valley, many washouts occurred during the storms of last winter. Temporary repairs were made at that time and the maintenance forces are now engaged in making permanent repairs including the construction of a 42-foot bridge at the site of the worst washout.

Newly Acquired Bridges Painted.

A contract has been let to D. E. Burgess for the painting of four steeel bridges on the Cholame Lateral which last year were taken over from San Luis Obispo County for maintenance by the state. The painting of the bridges is rapidly approaching completion.

Coast Highway Improved at Gaviota.

A Division Contract 95FFC1 has recently been awarded to Hodson & Carter of Santa Barbara for grading a line change in Gaviota Canyon at the approaches to the Gaviota Creek bridge which was recently constructed by Oberg Brothers under Contract 516. It eliminates two of the worst curves in the vicinity and constitutes a distinct improvement to the alignment of the Coast Highway through Gaviota Canyon.

Personal.

E. B. Brown, Resident Engineer in Division V, has been appointed City Engineer of Santa Barbara and assumed his new duties on August 1st. He has been with the California Highway Commission since its organization in February, 1912, and has been on construction work almost continuously since the latter part of 1913. His construction experience thus covers almost the entire period of construction activity of the California Highway Commission.

Ted Sullivan, Assistant Resident Engineer at Santa Barbara, has resigned to resume his studies at the University of California.

C. M. Butts recently with the Bridge Department has taken charge of the construction work in the vicinity of Santa Barbara formerly directed by Mr. E. B. Brown, now City Engineer of Santa Barbara.

J. H. Orr, for some time past draftsman with Division V, and formerly draftsman with Division II, has resigned his position with Division V to attend his ranch property in Oregon, after which he intends to undertake structural engineering work at Los Angeles.

J. T. Hays, for several years past Chief Clerk of Division V, has taken a leave of absence on account of his mother's health and is at present in San Diego.

DIVISION VI.

HEADQUARTERS, FRESNO.

E. E. WALLACE, ACTING DIVISION ENGINEER.

Counties of Fresno, Madera, Merced, Mariposa, Kings, Tulare, and Kern, north of the Tehachapi.

Kern Trees Making Steady Growth.

Trees along Route 4 south of Bakersfield are making a steady, healthy growth in spite of adverse conditions. An avenue of four-year-old Locust trees makes a pleasant fringe of green for 30 miles across the desert.

Thick Oiled Surface for Yosemite Highway.

Division VI has completed 34 miles of oiling by the mixing method on the Yosemite all-year highway. A surface two to three inches thick has been secured and the riding qualities of the road compare very favorably with the best pavement. The remaining 21 miles of earth and gravel road has been covered with a light oil for dust prevention.

Five miles of decomposed granite roadway connecting with the General's highway in Sequoia National Park have also been oiled for dust prevention and shoulders and roadsides through sandy sections along the main Valley highway have received oil treatment.

DIVISION VII.

HEADQUARTERS, LOS ANGELES.

S. V. CORTELYOU, DIVISION ENGINEER.

Counties of Los Angeles, Ventura, Orange, San Diego, and eastern Kern, south of Mojave.

Paving Jobs in Progress.

Along the Coast highway between Naples and Anaheim Bay bridge, Matich Brothers, Elsinore, contractors, have under way the paving of 1.5 miles with 20-foot cement concrete. The new pavement will fill gaps left unpaved several years ago to allow for settlement of the embankment.

Jahn and Bressi, Oceanside, contractors, are making excellent progress with new stretch of highway through Del Mar in San Diego County. They will also construct the approaches to the recently completed concrete overhead crossing of the Santa Fe tracks, at Del Mar.

Contractor George Herz and Company, San Bernardino, is placing concrete pavement on the contract for the reconstructing of that portion of San Diego to El Centro highway between La Mesa and El Cajon.

Highway Unit Opening Celebrated.

On the Oxnard-Capistrano highway, through Laguna Beach, all paving has been completed and open to traffic. A street dance was held to celebrate the opening of the new concrete pavement. United Concrete Pipe and Construction Company of Los Angeles was the contractor.

Another Dangerous Crossing Eliminated.

At Carlsbad in San Diego County, the new overhead crossing of the Santa Fe tracks, has been completed and open to traffic thus eliminating another dangerous grade crossing. This job was handled by Coon Brothers of Riverside. The approaches were built by Chas. E. Crowley of Los Angeles.

Engineer Takes Bride.

R. L. Thomas, Associate Engineer in Division VII, was recently married at San Bernardino to Miss Mabel M. Mussen of Long Beach. The couple are now visiting in northern California.

Popular Headquarters Girl Becomes Bride.

Miss E. Alta Ruff of Headquarters Accounting Department became a June bride when, on the 26th of June last at Westminster Church, she and Edwin H. Sandstad, a North Sacramento business man, were wedded.

(Continued from page 13).

STATE HIGHWAY FUND CONTRACTS (Bond Funds, Including Federal Aid)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE JUNE 23, 1927.						
515	III	Imperial	12	H-A	Top of Mt. Springs grade and Meyers Creek Bridge	6.8	Portland Cement Concrete Pavement	Jahn and Bressi Const. Co., Inc.	$416,255 00	Aug. 16, 1926	------
					AWARDED SINCE JUNE 23, 1927.						
527	II	Modoc	28	B	Across Rattlesnake Creek	------	R.C. Girder Bridge	Fred J. Maver and Son, Inc.	$10,511 44	July 7, 1927	100
528	1	Humboldt	1	K	Across Redwood Creek, one-quarter mile north of Orick	------	R.C. Girder Bridge	Mercer Fraser Co.	103,566 38	July 28, 1927	300
					Total State Highway Fund Contracts Awarded	------			$114,077 82		

NOTE.—Primary construction covered by the above contracts does not include funds obligated on cooperative forest highway projects, prison camp road activities, or day labor jobs not being done under contract.

STATE HIGHWAY MAINTENANCE FUND CONTRACTS (Including Gasoline Tax Fund)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE JUNE 23, 1927.						
M-141	VI	Merced	4	A	Between Merced and the southerly boundary	14.33	Asphalt Concrete Surface	Allied Contractors, Inc., of Denver	$185,909 84	Aug. 28, 1926	------
M-154	V	Santa Barbara	2	G	At the Ellwood Overhead Crossing	0.30	Surfacing, Crushed Gravel or Stone	E. Schelling	20,466 00	Nov. 29, 1926	------
M-159	VII	San Diego	2	B	At the Carlsbad Overhead Crossing	0.26	Rock Surfacing	Charles E. Crowley	14,235 75	Feb. 7, 1927	------
M-164	II	Siskiyou	3	A-B	Between Dunsmuir and Shasta River	------	Clearing and Grubbing Right of Way	J. P. Brennan	5,077 69	Mar. 9, 1927	------
M-165	II	Siskiyou	3	A	Near Weed, line change	0.22	Surfacing, Crushed Gravel or Stone	J. P. Brennan	9,083 25	Mar. 28, 1927	------
					AWARDED SINCE JUNE 23, 1927.						
911EC3	IV	Alameda	5	B	Arroyo Las Positas, Tassajero and Alamo Creek	------	R.C. Girder Bridges	George J. Ulrich	$27,534 15	July 7, 1927	125
911EC4	IV	Contra Costa	14	A	Wildcat Creek, one-quarter mile north of Richmond	------	1 R.C. Girder Span, 2 Slab Spans	Atlas Construction Co.	16,292 48	July 7, 1927	125
911EC5	X	Sao Joaquio	5	B	At Mossdale Undergrade Crossing	------	2 Concrete Abutments with Wing Walls	Fredrickson and Watson Co.	22,190 63	July 7, 1927	125
911EC6	III	Sacramento	3	B	Across Arcade Creek, east of Ben Ali	------	3 R.C. Girder Bridges	Peter F. Bender	37,791 56	July 28, 1927	150
910EC1	X	San Joaquin	4	C	Between Stockton and Cherokee Station	2.3	Crushed Gravel or Stone Surfacing	Irey and Holden	44,004 81	July 28, 1927	125
96FC1	VI	Kern	4	E	Lerdo to 1 mile north of Famosa	9.1	Asphalt Concrete Pavement	Force, Currigan and McLeod	224,052 39	July 28, 1927	150
96FC2	VI	Kern	4	F	One mile north of Famosa to 1 mile south of Delano	9.4	Asphalt Concrete Pavement	Valley Paving and Const. Co.	202,966 88	July 28, 1927	150
95FFC1	V	Santa Barbara	2	E	Gaviota Creek	------	Line Change at New Bridge	Ira Hodson	10,930 50	July 28, 1927	75
					Total State Highway Maintenance Fund Contracts Awarded	20.8			$585,763 40		

NOTE.—The above obligations charged against the State Highway Maintenance Funds do not include funds from these sources obligated for general maintenance and for specific betterments being done under day labor authorization.

CALIFORNIA STATE PRINTING OFFICE
SACRAMENTO, 1927

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CALIFORNIA HIGHWAYS

A BULLETIN ISSUED BY THE DIVISION OF HIGHWAYS FOR THE INFORMATION OF ITS EMPLOYEES AND THE PUBLIC

Vol. 4 AUGUST, 1927 No. 8

AIRPLANE VIEW OF SACRAMENTO.—Showing part of the business section to the right, Capitol Building and Capitol Extension Buildings in the center, with Capitol Park in the foreground. To the extreme left, showing dark, is the State Printing Plant. The Strub Building, housing the Motor Vehicle and Criminology departments and the Division of Highways, across the alley from the Printing Plant, was missed by the air man, connected with the 15th Photo Section of the Army Corps, Crissy Field, Presidio, San Francisco, who took the shot.

In this issue: CENSUS TRAFFIC MAP FOR JULY, 1927, OF ALL ROUTES IN THE CALIFORNIA STATE HIGHWAY SYSTEM, PAGES 8 AND 9.

SEP 15 1927

CALIFORNIA HIGHWAYS

This Bulletin is published by the California Highway Commission for the information of its employees and the public. Editors of newspapers and others interested are welcome to use, without restriction, any of the matter herein contained. Cuts will be gladly loaned upon request.

J. P. HALL - - - - - Editor
P. O. Box 1103, Sacramento, California.

Vol. 4 AUGUST, 1927. No. 8

CALIFORNIA DIVISION OF HIGHWAYS

C. C. YOUNG, Governor.

B. B. MEEK, Director of Public Works.

CALIFORNIA HIGHWAY COMMISSION
RALPH W. BULL, Chairman, Eureka.
J. P. BAUMGARTNER, Commissioner, Santa Ana
M. B. HARRIS, Commissioner, Fresno
JOSEPH M. SCHENCK, Commissioner, Los Angeles
FRED S. MOODY, Commissioner, San Francisco

R. M. MORTON, State Highway Engineer, Sacramento

HARRY A. ENCELL, Attorney, San Francisco
E. FORREST MITCHELL, Secretary and Disbursing Officer

HEADQUARTERS STAFF, SACRAMENTO
T. E. STANTON, Assistant State Highway Engineer
L. V. CAMPBELL, Office Engineer

FRED J. GRUMM, Engineer of Surveys and Plans
C. S. POPE, Construction Engineer
T. H. DENNIS, Acting Maintenance Engineer
CHAS. E. ANDREW, Bridge Engineer
R. H. STALNAKER, Equipment Engineer
C. L. McKESSON, Materials and Research Engineer

WILLIAM SCHLEIP, Principal Accountant
BEN H. MILLIKEN, Superintendent of Prison Road Camps

DISTRICT ENGINEERS
T. A. BEDFORD, District I, Willits
H. S. COMLY, District II, Redding
F. W. HASELWOOD, District III, Sacramento
J. H. SKEGGS, District IV, San Francisco
L. H. GIBSON, District V, San Luis Obispo
E. E. WALLACE (Acting), District VI, Fresno
S. V. CORTELYOU, District VII, Los Angeles
E. Q. SULLIVAN, District VIII, San Bernardino
F. G. SOMNER, District IX, Bishop
R. E. PIERCE (Acting), District X, Sacramento

General Headquarters, Third Floor, Strub Bldg., Eleventh and P Streets, Sacramento, California.

EVERY employee of the highway commission has a direct interest in the improvement of the highway organization's methods and results, both engineering and clerical, office and field. To that end, the State Highway Engineer invites constructive criticism or suggestions from every employee.

Ideas as to the more economical and efficient handling of your job, or suggestions for elimination of waste will be welcomed. Criticism is also desired from persons outside the organization, who are in a position to give facts.

Send only signed communications addressed as follows: California Highways, P. O. Box 1103, Sacramento, Cal.

GOVERNOR YOUNG COMPLETES APPOINTMENT OF COMMISSION

Governor C. C. Young has completed the appointment of the members of the California State Highway Commission, fulfilling that requirement of the Reorganization Act which increased the number of members from three to five.

The new commissioners are Joseph M. Schenck of Los Angeles and Fred S. Moody of San Francisco. The former is the well-known movie producer and a state leader of the south. Mr. Moody is a representative business man of the bay region and has had experience in affairs of state, having been a member of the Board of Harbor Commissioners.

In announcing the appointments Governor Young said:

"In securing their services I believe I have two of the most capable men in the state. Both are prominent in their respective communities and have told me they will devote their time and energy to the commissions work. I am highly elated over their acceptance."

The entire commission is now a geographically well-balanced organization consisting of—

Ralph W. Bull, Eureka, Chairman,
J. P. Baumgartner, Santa Ana,
M. B. Harris, Fresno,
Joseph M. Schenck, Los Angeles,
Fred S. Moody, San Francisco.

Incidentally they follow a variety of vocations and are as representative a body of men as could be selected in the entire state.

WHEN PAVING MEANS ECONOMY

According to H. J. Kuelling, State Highway Engineer of Wisconsin, it is economy to pave a road when it carries over 500 vehicles per day, the saving in maintenance cost and vehicle operation will, he writes, more than balance the first cost of the paving.

Wisconsin has not yet learned about how California handles heavy traffic with her oiled highways.

WHAT COUNTS.

You build for the future, my friend, every day.
The things that you do and the words that you say
Will some time rebound as a blessing or bane.
As sowing the seed brings a harvest of grain.

Then build life's foundations with diligent care
The granite of character slowly prepare.
Your speech counts for little unless it agree
With things that you do and with what you may be.

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AUGUST 1927

California Highways

VOL. 4 NO. 8

FOUR YEARS' EXPERIENCE WITH CONVICT WAGE

Reported by BEN H. MILLIKEN, Superintendent of Prison Road Camps.

"WHERE LIFE IS BETTER."—(1) Smith River Camp in Del Norte County, near Crescent City. (2) Healthy appetites are one of the products of the camps. (3) Living quarters. (4) Camp Hospital. (5) Character of country through which Kern River Highway was built; getting ready for the blast.

STATE prisoners have been used on state highway work since 1915, but only during the past four years have the workers received pay. On August 17, 1923, they became wage earners, and since then the operation of the system has been observed with increased interest.

While the pay law provides for a maximum gross wage of $2.50 per day, the wage has been set at $2.10, the average cost of maintaining the prisoners at the camps prior to the inauguration of the wage system. It was expected that the cost would be reduced by the coordination of prison camp activities, and the saving thus affected would represent the net earnings of the prisoners. Under this plan the average daily maintenance cost has been reduced from $2.10 to $1.82 allowing the prisoners an average net daily saving of $0.28.

Expense Deductions.

The items of expense which must be deducted from the gross wage of $2.10 are: meals, which includes cost of food, wages of kitchen help, freight on supplies, fuel, lighting, refrigeration and depreciation on cookhouse equipment; salaries of commissary men and clerks who work on convict records, camp doctor, barber, shoemaker, guards, office rent,

(Continued on page six.)

Ortega Hill Relocation to be Paved

COAST ROUTE HILL CONQUERED.—View of recently graded State highway along Santa Barbara channel, over Ortega Hill, near Summerland, Santa Barbara County. The roadway was daylighted giving autoists a view of the majestic Pacific.

(Reported by L. H. Gibson, District Engineer, District V.)

THE immediate paving of the recently graded and realigned state highway over the historic Ortega Hill and through Summerland, Santa Barbara County, has been assured by an extension to the contract of Sam Hunter, Summerland to Carpinteria. The Ortega grading was done in 1925.

Hill Removed For Ocean View.

The original grading project involved the removal of the entire side of the hill and the construction of fills from 10 to 25 feet in depth. Ortega Hill at this point precipitates abruptly into the ocean. The old road was forced back a half mile from the shore, taking a zig-zag course in making the grade. In constructing the new road a deep cut was made through the side of the hill and then in order to daylight the road and give motorists a full view of the Santa Barbara Channel at this point, the portion of the hill left between the roadway and the shore line was entirely removed. The fills were made in 8-inch layers, each layer being watered and rolled with a 12-ton roller. The compaction secured in this manner was so thorough that no appreciable settlement occurred since construction, in spite of the excess rains of last winter and a daily traffic running from 4000 to 10,000 vehicles.

Paving to be 30 Feet.

The new paving will be of Portland cement concrete and will cost the state $10 per cubic yard. By combining it with the present Hunter contract a saving will be effected and the public will have the use of a fine highway at a much earlier date than if handled as a separate job.

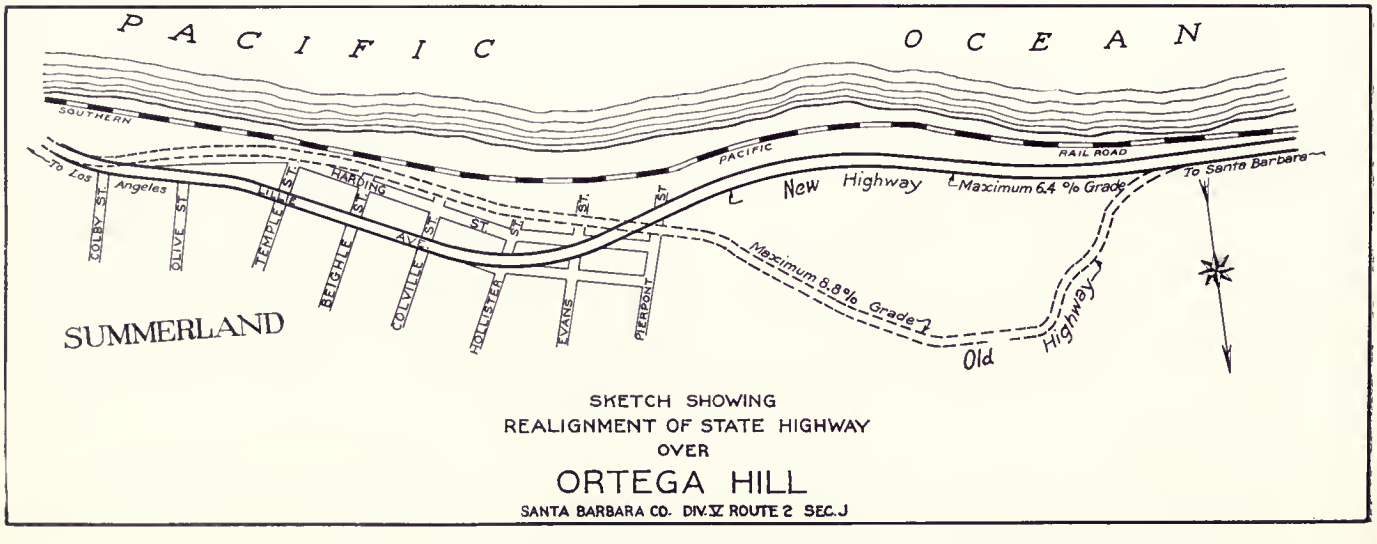
Paving to Reduce Maintenance Cost.

The maintenance of this piece of road, which is of standard rock surfacing, has been exceptionally heavy, a smooth surface being maintained only by continual sprinkling and dragging. The paving will eliminate this high maintenance cost, also the dust, which has been considerable in spite of the continual watering, and will make of this section one of the finest stretches of highway in the state.

History of the Road.

The Ortega Hill road dates back to the early days of the Spanish control of California, the hill receiving its name from Capt. Jose Francisco Ortega, often called the "Kit Carson" of the early Spanish expeditions into California. He was active in colonization work for 30 years and died near Santa Barbara February 3, 1798.

(*Continued on page five.*)



SKETCH SHOWING
REALIGNMENT OF STATE HIGHWAY
OVER
ORTEGA HILL
SANTA BARBARA CO. DIV. V ROUTE 2 SEC. J

New Method for Checking Maintenance Work

(By T. H. Dennis, Acting Maintenance Engineer.)

SINCE THE advent of heavy trucking on many of the state highway routes the matter of maintenance and the dispatch with which it is accomplished have become of much importance to the Division of Highways. The old adage of the "stitch in time" is extremely applicable to the situation as a break in a paved road, if allowed to be pounded for several days by traffic, soon becomes a piece of ruined highway, not to mention the inconvenience to travel and damage to cars.

T. H Dennis.

Checking up on the work of maintenance superintendents and foremen is therefore an important part of the work of the Maintenance Department and following a study of the situation the system now being inaugurated was adopted.

One of the central office assistants is assigned the northern, the other the southern section of the state, each being responsible for proper methods and results in his respective territory. Each assistant covers his territory approximately every three weeks, usually in company with the district maintenance engineer.

To insure against instructions issued at that time being entirely dependent on the district maintenance engineer's memory, it was deemed advisable to adopt a form, made out in triplicate, on which the defects of each section were noted, space being reserved for the comment of the district maintenance engineer, advising when and in what manner the corrections would be made. One copy of the report is left with the district maintenance engineer, one remains in the assistant's book and the other at central office. On the assistant's ensuing trip, he notes on his copy the corrective measures taken, if any, and if nothing has been done, requires an explanation from the district maintenance engineer. This form in which the district maintenance engineer definitely obligates himself to perform certain things would appear to have much merit, his efficiency being rated in proportion to his ability to perform.

That the spirit of responsibility may become more general, there will be kept a card index of the various foremen and superintendents assigned to maintenance. When the assistant reports section defects on his form, he will also note the name of the foreman and superintendent on whose sections these occur. These reports will serve as a merit or demerit system for the respective men, and should by their continued tenor, indicate those most valuable to the organization.

The following is a typical copy of the form adopted for the work with suggested criticisms filled in:

State of California
CALIFORNIA HIGHWAY COMMISSION
Maintenance Inspection Report

Town _____ California
Date _____ 192____

Mr. R. M. Morton,
State Highway Engineer,
Sacramento, California

Attention—Maintenance Department

Dear Sir:

An inspection of road _____ County _____ Route _____ Section _____ (Foreman) _____
on _____ Date _____ shows the following which needs attention

Shoulders low, guard rails broken, excess oil used in patching, crack filling sloppy—Heavy truck used where light is available. Crew work slow.

In discussing this matter with District Maintenance Engineer _____
I am advised that their plan is as follows:

Shoulders will be built up at once. Rails will be repaired next week. Will personally inspect patching and crack filing. Will advise foreman on necessity of efficiently handling crew and equipment.

_____
District Maintenance Engineer

_____
Assistant Maintenance Engineer

Inspected above on _____ Date _____ 192____. Work completed. Appearance of work and of crews improved.

Ortega Hill Relocation to be Paved

(Continued from page four.)

In addition to Ortega Hill, a bad situation existed immediately to the east, through the town of Summerland. The street on which the former 15-foot pavement was placed has a width of only 30 feet. On one side are business buildings, one the other tracks of the Southern Pacific Railroad. A new location was adopted on a residence street one block from the former location. The street was widened to 80 feet by purchasing lot frontages and moving several buildings. Condemnation suits were necessary before all rights of way could be obtained. Originally there were nearly 200 defendants in these suits but through negotiation most of the needed property was purchased without trials.

IS YOUR STATE FUNCTIONING IN ROAD BUILDING IN PROPORTION TO ITS ABILITY AND NEEDS?

UNDER THE above heading "American Highways," a quarterly publication, issued by the Association of State Highway Officials, in its July, 1927 issue, prints a comparative tabulated statement of highway figures for all the states of the Union. It then askes the following questions:

How does your road mileage compare with your area and population to be served? Wealth is the way to find out your ability to pay but number of motor vehicles govern much of the highway financing of today.

How does your state rank in wealth correspond with your rank in number of motor vehicles?

Should not your receipts from motor licensed fees and gas tax put you in the same rank as your number of motor vehicles?

If you rank low in mileage of roads improved is your state keeping pace with this need in proportion to her wealth?

The figures for California are as follows:

2d in Area.
2d in Autos and Trucks.
3d in Basic Wealth (Farms, Mines and Forests).
4th in Auto License and Gas Tax Receipts.
5th in National Wealth.
7th in Population.
3d in Concrete Highway Mileage.
7th in Miscellaneous Mileage.
9th in Graded and Drained Mileage.
10th in Bituminous Macadam Mileage.
10th in Bituminous Concrete Mileage.
17th in Improved State Highway Mileage.
20th in Total State Highway Mileage.

Althought the tabulation fails to give California credit for an additional 581 miles of rock-surface mileage, much of which is now oiled, it furnishes much food for thought.

FOUR YEARS' EXPERIENCE WITH CONVICT WAGE

(Continued from page three.)

phones, telegrams and stationery, accident insurance for free employees, commissary supplies, including clothing, bedding, tobacco and toilet articles, and incidentals, cost of camp maintenance, rewards for escapes and expense of returning them to prison, and transportation to and from prison.

A reward of $200 is allowed for the capture of each escaped prisoner, and as this amount is a direct charge against the gross wage, it creates resentment among the prisoners against those contemplating escape. Careful selection of those to be sent to the camps, improved camp conditions, humane treatment by free men in charge, a reduction of guards, thereby extending the honor system, and proper recreation facilities are other factors that have contributed toward the reduction of escapes.

Recreation.

The recreation fund consists of earnings forfeited by prisoners who escape or are returned to the prison for violation of camp rules, together with interest on prisoners' earnings. With this fund, radios, motion picture projectors, and baseball, handball, and boxing equipment have been purchased, and recreation halls have been built. Express on weekly film service has been paid and daily newspapers provided. The Film Board of Trade in San Francisco each week supplies free of charge a feature and comedy for each camp. Publishing companies supply all the late magazines free and each camp has a library well stocked with good books.

Not only have beneficial effects of the system been noted at the camps, but also within the prison walls, for the possibility of road assignment is an incentive for prisoners to keep their records clear. The camps have affected a saving of several hundred dollars per day in prison support and have made aid possible to prisoners' dependents through allotments from road earnings. The outstanding beneficial feature is the opportunity for prisoners, while still serving time, to prove that they can do an honest day's work and that they intend to make good upon release. Incidentally, they all ask parole while in prison, making many promises for the future and the road camp furnishes opportunity to try out their good intentions. The marked improvement in health, morals and general outlook on life, however, is not to be overlooked when considering the accomplishment of the prison road camps.

Four Years' Figures.

For every two days a prisoner spends in a road camp he is given credit for an extra prison day. To date, the total number of convict days spent in camp is 511,801, which, with an added 255,900 extra time earned, has resulted in a saving of 767,701 convict days in prison support.

The total gross earnings of the prisoners has been $1,074,788, less $961,705, deductions, leaving a net of $144,782, or an average daily saving per worker of $.283. The total amount alloted to dependents has been $33,395.

The average time spent in camp has been 10½ months, while the average net earning of those who make good has been $85. The record net earning by any one prisoner is $660.

Since August 17, 1923, when the pay law became effective, approximately 2000 prisoners have gone through the road camps. The large majority of these men have been released on parole, the remainder discharged free. When a prisoner is paroled it is a prerequisite that he have employment to go to, guaranteed by a responsible citizen. His transportation is paid by the state from the point of his release to the place of employment. In the case of a discharged prisoner, the state pays his transportation to the point of arrest.

The conduct of hundreds of released prison camp men has been closely observed and the conclusion has been reached that it is not only desirable but necessary that they have some money with which to make a start. Too much money, however, is a detriment as it gives the ex-prisoner a feeling that he can put off thoughts of serious work. A complete outfit of clothing and bedding and $85 in cash, the equipment which the average released prisoner takes with him, is believed to be sufficient.

THE CARLSBAD OVERHEAD

Upper, The old Carlsbad grade crossing of the Santa Fe main line to San Diego which has been eliminated from the State Highway by a line change and a new overhead crossing. *Lower,* The new concrete structure which carries the traffic safely over the tracks.

The completed Carlsbad overhead crossing in San Diego County is another step in furthering the plan of the Division of Highways to build safety into state roads. The new structure crosses the Santa Fe railroad on a relocation and diverts the through traffic from one of the town's main streets.

The new overhead is 165 feet long and has a 30-foot roadway and a 5-foot sidewalk. The cost of the structure was $19,803, shared equally by the railroad company and the state. The job was started by Coon Brothers and finished by Leadbetter & Company. Resident Engineer W. B. Anderson was in charge at the completion of the job.

Material for the approaches was obtained from the railroad company's excavation made necessary by the relocation of a side track. The cost of the overhead and approaches totaled approximately $40,000.

WISCONSIN'S TOURIST CROP

The state of Wisconsin has made an expert study of its annual tourist crop and has arrived at figures as to just how much it means to the state in dollars and cents.

Traffic counts indicate that 9000 cars from other states come into Wisconsin daily during the touring season. Questionnaires answered by tourists show that cars carry an average of 3.6 passengers and stay in the state an average of 8.5 days. Expenditures average $2.82 per person per day. Cars travel an average of 586 miles in the state. About 35 per cent of the tourist camp out, 55 per cent stay in hotels and the balance have summer homes. Gas tax revenues are approximately $600,000 per year from tourists. On this basis a rough estimate puts the gross tourists business at $100,000,000 per year, which is approximately one-third as much as the state's largest business—dairying.

LOOKING BACKWARD

(By J. H. Skeggs, District Engineer, District IV.)

A review of historical data in relation to highway construction invariably discloses some point of interest for "California Highways." In looking through the old files in the District IV office of the Division of Highways at San Francisco, the following letter was found under the date of April 19, 1916. It is a plea from the Santa Cruz Chamber of Commerce that the newly graded road (the state highway from Los Gatos to Santa Cruz) be kept watered, so that the "splendid work done by the Highway Commission would be maintained." In order to emphasize the necessity of granting their request, a traffic count was kept.

S. A. Palmer, then President of the Santa Cruz Chamber of Commerce, and W. S. Moore, Chairman of the Good Roads Committee, in the letter reports the count as: 618 automobiles; 32 motorcycles and 29 buggies.

It is not quite definite from the above at just what point on the highway the traffic count was taken by the Santa Cruz Chamber of Commerce. Nevertheless, it is of particular interest at this time to compare the figures in this old count with the latest check made by the State Division of Highways, covering a 16-hour period on Sunday, July 17, 1927. This recent tabulation shows that at the city limits of Los Gatos 9616 automobiles passed during the 16-hour period of the count, while during the same period at the city limits of Santa Cruz, 7712 automobiles passed the observer.

The 1927 count makes no reference to buggies, indicating that the horse-drawn means of transportation has dropped to almost a negligible factor in present day highway traffic study.

TAKING HIGHWAY PHOTOGRAPHS

THE FOLLOWING is an extract of an article on "Some Thought on the Taking of Highway Photographs" in "The Highway Magazine" for August:

Viewpoint—General views of highways should be taken from an elevation, from the seat of a truck or higher, and from the edge of the pavement, facing traffic. Different viewpoints serve to bring out different facts. Choose the viewpoint that best serves the reason for the picture.

Detail—While pictures as a whole convey impressions, it is the details that are usually most valuable to the engineer. Catching the desired detail is worth experimentation.

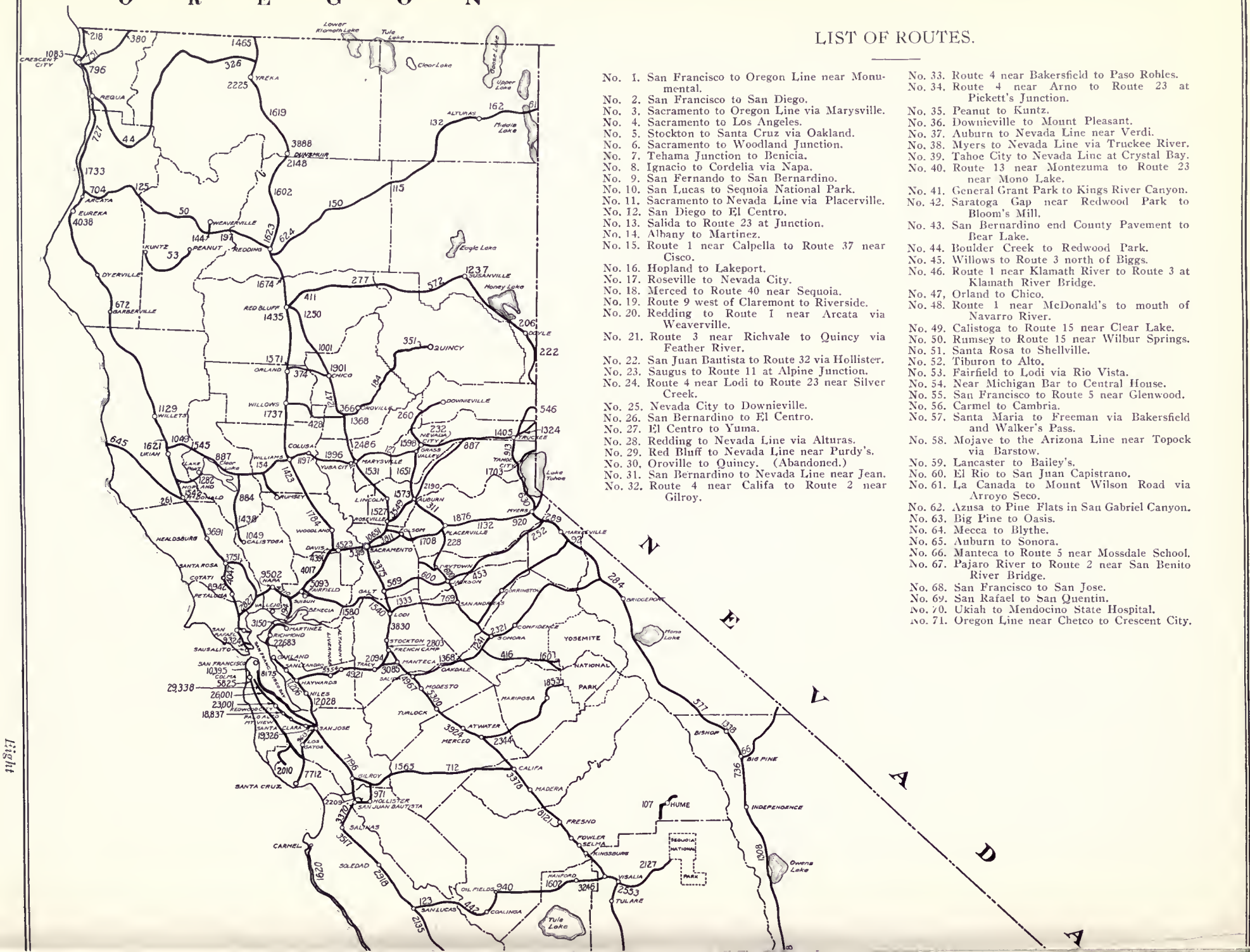
Action—Pictures showing construction are best without the distracting influence of traffic. However, photos to show methods and equipment require action. If possible they should be taken with workmen unconscious of the camera, at work and not posed; likewise traffic scenes.

Data—Don't forget the data on the back of the photo. Many times they are useless without it.

Composition—A logical and concise technical report, excluding unimportant and misleading details, gets its message over most effectively.

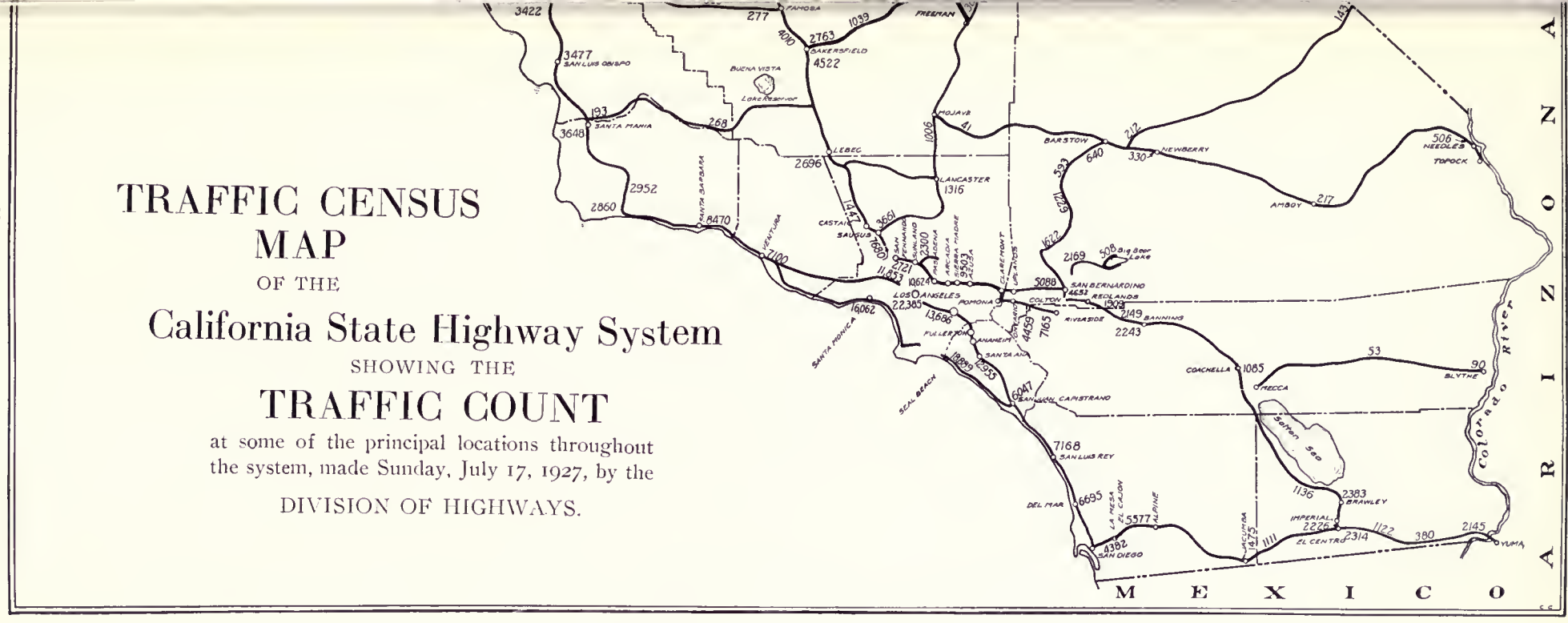
Precautions—Hold your camera level. Removal of weeds or rubbish from the foreground might improve the view. Keep unimportant details out of the foreground. Avoid standing over edge of pavement or any line that will divide the view. Include the vanishing point in a road view.

Many a highway scene is snapped impulsively, with only hazy notions as to what it is being photographed for. A moment's thought as to what purpose the view will serve, as well as to the mechanics of the camera, will usually aid in taking it more effectively. Or, perhaps, after a moment's hesitation you won't snap it at all.



LIST OF ROUTES.

No. 1. San Francisco to Oregon Line near Monumental.
No. 2. San Francisco to San Diego.
No. 3. Sacramento to Oregon Line via Marysville.
No. 4. Sacramento to Los Angeles.
No. 5. Stockton to Santa Cruz via Oakland.
No. 6. Sacramento to Woodland Junction.
No. 7. Tehama Junction to Benicia.
No. 8. Ignacio to Cordelia via Napa.
No. 9. San Fernando to San Bernardino.
No. 10. San Lucas to Sequoia National Park.
No. 11. Sacramento to Nevada Line via Placerville.
No. 12. San Diego to El Centro.
No. 13. Salida to Route 23 at Junction.
No. 14. Albany to Martinez.
No. 15. Route 1 near Calpella to Route 37 near Cisco.
No. 16. Hopland to Lakeport.
No. 17. Roseville to Nevada City.
No. 18. Merced to Route 40 near Sequoia.
No. 19. Route 9 west of Claremont to Riverside.
No. 20. Redding to Route 1 near Arcata via Weaverville.
No. 21. Route 3 near Richvale to Quincy via Feather River.
No. 22. San Juan Bautista to Route 32 via Hollister.
No. 23. Saugus to Route 11 at Alpine Junction.
No. 24. Route 4 near Lodi to Route 23 near Silver Creek.
No. 25. Nevada City to Downieville.
No. 26. San Bernardino to El Centro.
No. 27. El Centro to Yuma.
No. 28. Redding to Nevada Line via Alturas.
No. 29. Red Bluff to Nevada Line near Purdy's.
No. 30. Oroville to Quincy. (Abandoned.)
No. 31. San Bernardino to Nevada Line near Jean.
No. 32. Route 4 near Califa to Route 2 near Gilroy.
No. 33. Route 4 near Bakersfield to Paso Robles.
No. 34. Route 4 near Arno to Route 23 at Pickett's Junction.
No. 35. Peanut to Kuntz.
No. 36. Downieville to Mount Pleasant.
No. 37. Auburn to Nevada Line near Verdi.
No. 38. Myers to Nevada Line via Truckee River.
No. 39. Tahoe City to Nevada Line at Crystal Bay.
No. 40. Route 13 near Montezuma to Route 23 near Mono Lake.
No. 41. General Grant Park to Kings River Canyon.
No. 42. Saratoga Gap near Redwood Park to Bloom's Mill.
No. 43. San Bernardino end County Pavement to Bear Lake.
No. 44. Boulder Creek to Redwood Park.
No. 45. Willows to Route 3 north of Biggs.
No. 46. Route 1 near Klamath River to Route 3 at Klamath River Bridge.
No. 47. Orland to Chico.
No. 48. Route 1 near McDonald's to mouth of Navarro River.
No. 49. Calistoga to Route 15 near Clear Lake.
No. 50. Rumsey to Route 15 near Wilbur Springs.
No. 51. Santa Rosa to Shellville.
No. 52. Tiburon to Alto.
No. 53. Fairfield to Lodi via Rio Vista.
No. 54. Near Michigan Bar to Central House.
No. 55. San Francisco to Route 5 near Glenwood.
No. 56. Carmel to Cambria.
No. 57. Santa Maria to Freeman via Bakersfield and Walker's Pass.
No. 58. Mojave to the Arizona Line near Topock via Barstow.
No. 59. Lancaster to Bailey's.
No. 60. El Rio to San Juan Capistrano.
No. 61. La Canada to Mount Wilson Road via Arroyo Seco.
No. 62. Azusa to Pine Flats in San Gabriel Canyon.
No. 63. Big Pine to Oasis.
No. 64. Mecca to Blythe.
No. 65. Auburn to Sonora.
No. 66. Manteca to Route 5 near Mossdale School.
No. 67. Pajaro River to Route 2 near San Benito River Bridge.
No. 68. San Francisco to San Jose.
No. 69. San Rafael to San Quentin.
No. 70. Ukiah to Mendocino State Hospital.
No. 71. Oregon Line near Chetco to Crescent City.



STATE HIGHWAY TRAFFIC INCREASE SHOWN BY JULY, 1927, COUNT

THE semiannual traffic count made by the Division of Highways is primarily for the purpose of gathering data to be used by the state's road builders as a guide for contemplated future construction. The heavy duty roads are those most liable to require reconstruction and maintenance attention, the amount of traffic being good index as to the justifiable work a road should receive.

The traffic count determines many other useful facts. It furnishes information which determines whether certain highway routes are used for commerce or pleasure; it serves as a comparative working test for different types of construction and it is the best means of obtaining definite information regarding the trend of traffic.

First Census in 1924.

The first general count was made in 1920 by the Bureau of Public Roads in an investigation of the highways system. Two years later the Bureau again made a count in cooperation with state forces, obtaining records at 240 locations.

In 1924 the maintenance forces made their first count at 300 stations. The count was taken for 16 hours, 6 a.m. to 10 p.m. on a Sunday and Monday during the months of April, June, August, October and December.

Early counts were exhaustive as to classification of vehicles, the distribution of the traffic over the width of the pavement, as to the paths of the traffic in relation to curves, condition of shoulders, trees, guard rails, etc.

In later counts some of the early observations were omitted and at present traffic is classified as to autos, trucks (light and heavy), trailers, busses and tractors.

During the past two years the number of observation points has been increased, the count being taken at 757 points in 1926 and at 818 in 1927. At points of heavy traffic four counters are necessary, and the number of employees used in this work is now around two thousand.

Traffic Conditions.

As new routes are opened and more means of travel established in the areas of heaviest traffic the yearly counts show some changes, but for the state as a whole there appears to be an increase each year. However, the July, 1927, census in certain localities show less uniformity than that of previous years. The following figures show sections not running true to form:

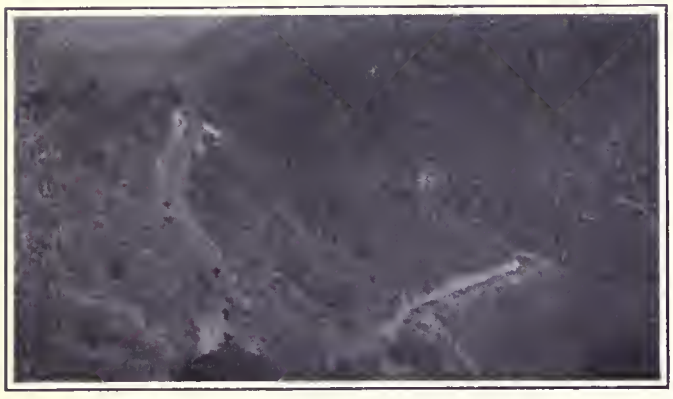
	1925	*1926*	*1927*
Santa Monica	25,661	28,271	16,062
Los Angeles, Indiana Street	23,806	22,595	22,385
San Jose, north of city limits	22,623	19,663	19,326
Seal Beach	17,369	18,569	18,889
Santa Ana, north of city limits	12,429	13,283	12,955
Fresno	11,167	10,941	8,121
Chico, at De Sabla Junction	2,503	2,413	1,520
Benicia, north of city limits	903	1,013	794

A change in the location of the observation station at Santa Monica and Fresno may account for the decrease for 1927. At Santa Monica the 1925 and 1926 counts were taken near Santa Monica Canyon and the 1927 count at Beverly Blvd. The Fresno 1925 and 1926 counts were north of the city at Roeding Park county road junction and the 1927 south of the city at Church Avenue. At the other cities the counts are taken at the same place each year.

(Continued on page ten.)

STATE HIGHWAY TRAFFIC INCREASE SHOWN BY JULY, 1927, COUNT

(*Continued from page nine.*)



Fourth of July traffic in the San Bernardino Mountains.

Important traffic points holding up for the usual gain are:

	1925	*1926*	*1927*
San Bruno	25,281	27,916	29,336
Near Oakland	18,116	19,931	22,683
Anaheim	11,932	13,245	14,403
Sacramento	10,140	11,357	12,734
Santa Barbara	12,887	7,557	8,479
Modesto	4,571	5,173	6,601

Typical Sunday traffic between San Fernando and Newhall, Los Angeles County.

Oddities in Count.

The heavy 1925 count at Santa Barbara was due to the visits of sight-seers following the earthquake.

Hayward, Alameda County, perhaps takes the prize for the largest gain. South of the city limits the 1926 count was 7,933, while the 1927 total amounted to 17,206, a gain of 117 per cent. The Hayward travel on Sunday is three times that of Monday.

Throughout the state, except on certain routes which can be classified as commercial roads, the Sunday travel uniformly runs about twice that of Monday. In the 1925 count, taken for seven days, it was determined that the Sunday travel was about 25 per cent of the week's total; Saturday, 17 per cent and for the remainder of the week from 11 to 13 per cent daily.

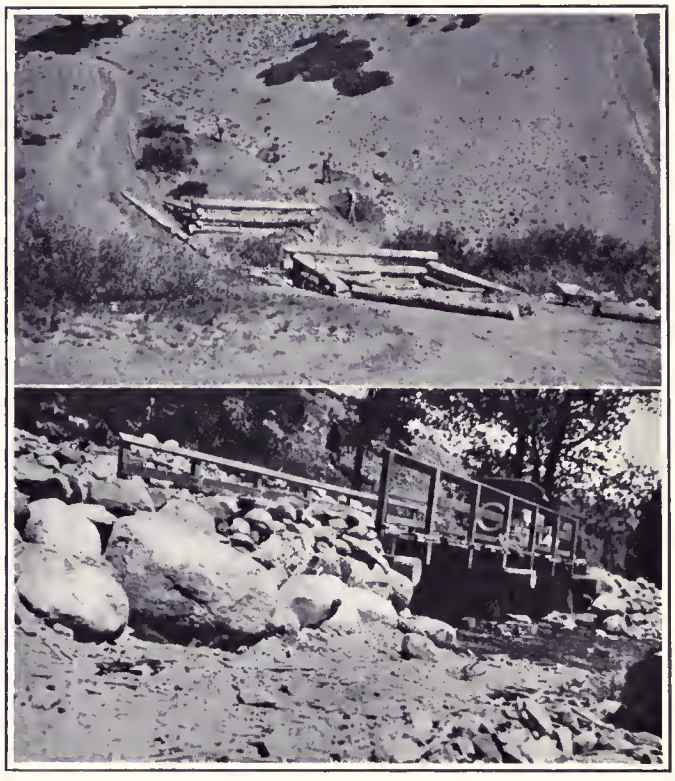
The Monday traffic across the Oregon line on the Redwood Highway in July, 1926, was more than on Sunday, July 17, 1927, and the cross line travel into Oregon on the Pacific Highway showed practically no increase this year. The Monday traffic at De Sabla Junction near Chico was 2148, the Sunday count dropping to 1520. All of the counts given in this article and on the traffic map in this issue are for Sunday.

Count Assisting Construction.

From the general increase noted yearly in the traffic the Maintenance Department has prepared a chart setting forth the expected increase up to the year 1940. As all California state highways are now being constructed to take care of future traffic, as well as that of the present, the traffic count in this way has become a valuable aid to the Construction Department.

DISTRICT IX LOG BRIDGES

(Reported by F. G. Somner, District Engineer, District IX.)



Upper—Starting a log bridge across Soda Creek, near Sonora Pass.
Lower—A completed log bridge across Wolf Creek on the Sonora Road.

ON THE Sonora road between Sonora Pass and Sonora Junction, Mono County, the Construction of log bridges across Wolf Creek, Silver Creek, and Soda Creek were completed August 10th. The fording of these crossings has always been an obstruction to traffic during the spring melting of snow and this improvement together with widening and alignment changes in progress is welcomed by the traveling public.

COMMEND HIGHWAY EMPLOYEES.

The central office is in receipt of a letter from the California Real Estate Association of Los Angeles commending the cooperation they received from employees of the Division of Highways while traversing the Redwood highway in the vicinity of the new construction in Humboldt and Del Norte counties. They were on their way to the National Convention in Seattle.

Equipment Report for 78th Fiscal Year

The following recently written to Superintendents of Equipment and accompanying a consolidated statement of the operation of stores and shops for the 78th fiscal year, gives a good idea of the system used by the Division of Highways in keeping a close check on its equipment and stock.

(By R. H. Stalnaker, Equipment Engineer.)

ENCLOSED HEREWITH is a consolidated statement of operations of shops and stores for the 78th fiscal year. Comparison with the statement for the previous year shows a much healthier condition of the Equipment Department and the statement for this year shows an apparent surplus of nearly $98,000 above depreciation requirements. However, during the past year the actual purchases of equipment charged out on the headquarters books amounted to approximately $864,000 or $65,000 more than the total depreciation reserve collected during the same period. Depreciation reserve collected and the amounts expended for new equipment in the various districts during the fiscal year in thousands of dollars were as follows:

R. H. Stalnaker.

I	$187,000*	$120,000
II	60,000	72,000
III	109,000	60,000
IV	41,000	61,000
V	53,000	60,000
VI	72,000	71,000
VII	117,000	130,000
VIII	100,000	89,000
IX	22,000	42,000
X	84,000	83,000
Hdq.	19,000	11,000
	$864,000	$799,000

*Includes approximately $51,000 for 10 heavy duty dump trucks purchased in May, but not actually delivered to the district for service until late in June and early in July.

The above figures represent actual expenditures for new equipment only and do not include the cost of fitting up government trucks which we had on hand and on which we have installed dump bodies, oilers, and other equipment.

During the past year 32 of these trucks have been equipped and issued to the districts and in addition to this there have been a good many transfers of these government trucks from one district to another. A good deal of this was occasioned by the fact that some of the districts have released many of their heavy trucks, replacing them by the 1½-ton pneumatic job. During the past year a good many of the old government trucks have been discarded and have been replaced either by government trucks in good shape or by purchased lighter trucks. In districts where this took place, to a large extent, the upkeep costs are of course somewhat below the normal. Another factor which affects depreciation charges is the sale of discarded equipment. In some of the districts considerable loss was sustained in disposing of this old equipment and in none of them was any appreciable profit realized from such sales. All these factors affect the results of the rental operations in the districts quite seriously and no doubt a good share of the divergency between the different districts is due to the variations in these factors.

Comparison of the inventory value of our equipment at the beginning and end of the fiscal years shows the following:

Inventory value of rental equipment June 30, 1927	$3,579,561
Inventory value of rental equipment June 30, 1926	3,259,650
Increment during year	$319,911

In the above figures the government equipment and equipment purchased prior to January 1, 1924, is included at an appraised value as of that date as set forth in the instructions for the preparation of the annual inventory. All equipment purchased since that date is carried at full purchase price, including cost of additions and equipment.

A WORD FROM SOUTH AMERICA

The following letter written in Spanish has been received by the editor. Translated by Mrs. Helen Halsted of the Maintenance Department, it reads:

Valparaiso, July 21, 1927.

Editor of California Highways,
Sacramento, California.
Our Dear Sir:

We wish to inform you that until this date we have received with regularity your important publication and have read with much pleasure your interesting articles which carry reports about your projects.

The punctuality with which you send these pleases us greatly and we pray that you accept our congratulations in regard to the excellent foundation on which your publication is based.

At this time we wish to ask you if you will please inform us if you receive regularly our magazine "Caminos y Turismo" which we send you periodically.

Very truly yours,
Automobile Association of Valparaiso.

His Last Laugh.

"Ha, ha, we're doing fifty now and that crazy motorcycle cop back there is trying to race with us."—Pitt Panther.

PHOTOGRAPHS OF SAND

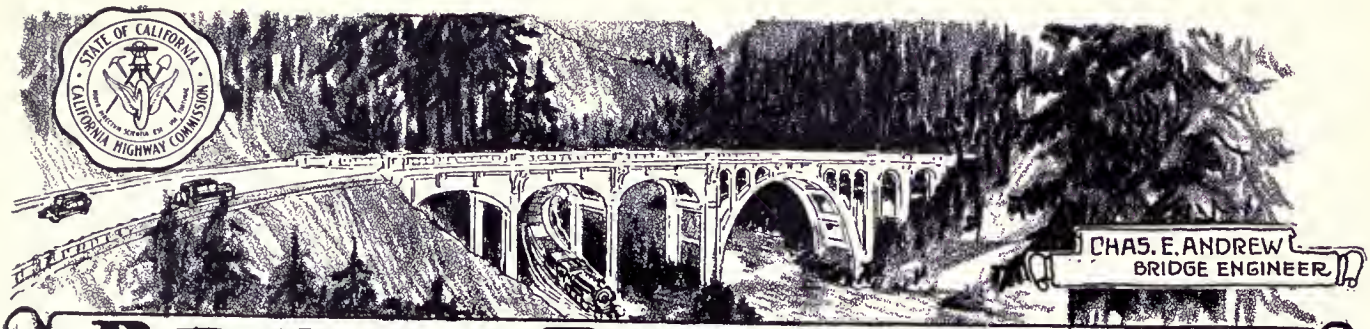
Herbert C. McKay, in the June 25, 1927, issue of Rock Products, suggests that the sand producer establish the practice of having photomicrographs made of his sand for the purpose of showing its physical characteristics. He feels that such information would be a valuable supplement to the usual data of grading, concrete and mortar strength, etc. He states that:

"Moreover, a series of such photomicrographs, kept on file, will soon show clearly whether the quality of sand is uniform, and if not the series will show the trend of the change as clearly as a graph would show it. In short, the photograph shows at a glance that information which, if compiled from laboratory reports, would require a lengthy period, perhaps several hours, and even then the photographic record is visual, vivid, tangible, while the compilation from the reports is after all but a mass of figures which carry little conviction except to those who are mathematically inclined. We run up against that classic quotation which should hang in the office of every business executive:

'One Picture is Worth a Thousand Words!'"

Mr. McKay states that the cost of preparing such photographs would not be excessive.

Little Boy: Please, may I have my top?
Motorist (who had just parked): Yes; but where is it?
Little Boy: Stuck in the flat front tire of yours.



BRIDGE DEPARTMENT

SANTA MARIA STRUCTURE A MODERN IMPROVEMENT

Upper, Recent completed concrete bridge across Santa Maria overflow channel on the Coast Route in San Luis Obispo County; *Lower,* North end of bridge shows it relocated on an elevation to avoid washouts that have been frequent in the past.

The recently completed concrete bridge over the Santa Maria overflow channel on the Coast route in San Luis Obispo County, is a modern and welcomed improvement. It replaces a dilapidated timber bridge and in the relocation of the north end frequent washouts of highway at this location will be avoided. It is 1370 feet long and has a 24-foot roadway.

CARQUINEZ BRIDGE TRAVEL.

In 42 days, July 1st to August 11th, inclusive, a total of 171,109 vehicles passed over the Carquinez bridge; a daily average of 4,076.

Ben Ali Subway Construction

(Reported by J. J. GALLAGHER, Assistant Bridge Engineer.)

The construction of Ben Ali subway beneath the tracks of the main Overland route of the Southern Pacific, a short distance east of North Sacramento, is progressing in a satisfactory manner.

At the location of the work there was no grade, the tracks being on a level with the surface, necessitating excavations to a depth of 20 feet. Seepage to the extent of four feet had to be pumped during the process of the work and the resultant pressure taken care of in the course of construction.

In order that pavement would not lift under hydrostatic head when pumping was stopped, pavement three feet thick is required at the low point of subway. The thickness of pavement varies from standard 6-inch section at points 200 feet either side of low points to 3 feet at bottom. Walls are carried up to elevation of 29 feet on both sides so that below this elevation the structure is like a boat 400 feet long. All construction joints are sealed with copper strips to prevent seepage. A 30-foot clear roadway and a 5-foot sidewalk will adequately provide for the traffic at this point. This route carries east side traffic for the Sacramento Valley, that of the Auburn-Truckee route and part of the Placerville route travel. The traffic averages over 5000 cars daily.

MOSSDALE BRIDGE OPENED TO TRAFFIC.

The new Mossdale bridge was opened to traffic August 29th following the completion of fills for both approaches and a portion of new roadway by contractor J. E. Johnson of Stockton. The fills involved the placing of 40,000 cubic yards of material, taken from the San Joaquin River by a suction dredge.

The bridge was recently completed by the state following work by two different contractors. It is a steel structure, 300 feet long and having a 24-foot roadway. A bascule lift provides for the passage of river transportation. It replaces an old timber bridge of too light structure to accommodate present heavy traffic.

This improvement is on 5, the Valley Route, 12 miles from Stockton and 8 from Tracy.

CONSTRUCTION PROGRESSING.

The Rio Vista River creosote timber bridge is progressing under contractor Leonard T. Isham according to schedule. All the piles have been driven and cut to grade and the erection of trusses will soon begin.

This project is taken care of by a legislative appropriation of $80,000. The state furnished material to the extent of $14,795 and contractor Isham's bid was $54,715.

SILICA TO BE USED

In the two concrete bridges to be constructed at Arno, on Route 4, about 20 miles south of Sacramento, an experiment will be made in the use of diatomaceous silica in the concrete mix for the bridge rail. Its use will permit a 33 per cent reduction in the amount of cement used, 6 sacks of cement instead of 9 being used to the cubic yard of aggregate.

Silica has the effect of reducing voids in the concrete, making it more nearly waterproof, makes the mix easier to handle and is practically a saving of three sacks of cement to the cubic yard.

His Problem.

A revival was raging in a Georgia negro church. The fruits had been considerable. One obdurate soul, however, resisted the efforts of the elder. Called to account for his reluctance, he replied: "Yo' see how it is, elder. How's I gwine get mah shirt on ovah my wings when I gets to glory?" "Dat ain't yo' problem," retorted the exhorter promptly. "Yo' problem is how yo' gwine git yo' hat ovah yo' horns."

PLANS COMPLETE FOR SUTTER CAUSEWAY.

Plans are now practically complete for the causeway across the Sutter By-Pass on the Woodland-Yuba City highway and specifications are being prepared. Tests have been taken for the pile driving. The causeway will have a 24-foot roadway and will be 5160 feet long. Dredger cuts at each side of the By-Pass are being spanned by removable structures providing 76-foot openings for the passage of dredgers.

The structure which is being built by the Division of Highways was financed by a special legislative appropriation of $200,000. The project will soon be ready for the advertisement for bids.

PLANNING SMITH RIVER BRIDGE.

The Bridge Department is now preparing plans and estimates for the Smith River bridge in Del Norte County. This structure will span the river at a point where it has a width of 400 feet. It will make possible the opening of some of the recently constructed Redwood highway, east of Crescent City. The new road at this location avoids a very difficult grade. Del Norte County will cooperate in the financing of the bridge.

PERSONAL NOTES.

H. J. Peacock has taken an assignment as Assistant to Resident Engineer A. L. Lemhart in Humboldt County where a group of bridges are being built, the principal one of which is the Redwood Creek bridge at Orick.

George J. Porter, who has been in charge of the core drilling rig used on preliminary bridge surveys, is taking a vacation.

Paul Dunkhorst has returned to his desk after a two-weeks vacation spent in San Francisco with his family.

Albert Willett has returned to the Bridge Department after a short leave of absence during which time he and his mother visited with relatives in St. Louis, Missouri.

HEADQUARTERS OFFICE PERSONALS.

George C. McCoy, formerly assistant state highway engineer of the state of Washington, has been appointed assistant office engineer in the headquarters office.

Joseph M. Kane has recently been added to the engineering staff in the headquarters drafting room. Mr. Kane comes to us from the Nevada State Highway Department where he was employed during the past nine years.

T. A. Hawthorne of the Drafting Department and George Gunston, assistant secretary, recently spent two weeks with the National Guard encampment at Del Monte, both being lieutenants in the artillery corps.

W. F. Faustman and family spent a week recently in the Yosemite Valley. Faustman has also been chasing the "elusive pill" around various golf links in the San Francisco bay region.

R. F. Reynolds is spending a couple of weeks hunting and fishing in the Klamath River region in Siskiyou County. He is a mighty bow and arrow artist, and perhaps will try the arrow on some of the bears in that region.

C. S. Pope of the Construction Department began his vacation with an injury received while putting too much force behind a car. A very severe case of Santa Barbara sunburn later prevented enjoyment of his two weeks off. Mrs. Pope accompanied him on the trip.

Andrew Mains spent his vacation driving to Colorado, and climbing Pike's Peak. Andy says California roads have it all over the roads in Utah, Colorado and Wyoming.

Bill Bock is very fond of camping out and he and family recently spent a week in the Yosemite Valley.

On almost any of these fine summer mornings you will find several highwaymen disporting themselves over local golf links. They say Tom Stanton and Charles Andrew are practicing hard for the State Fair championship matches. A headquarters golf tournament is projected for this fall, and great excitement will prevail at Land Park links.

DESERT HIGHWAY WORKERS IN BATHING SUITS

(Reported by District VIII.)

HANG YOUR CLOTHES ON A HICKORY LIMB.—Maintenance man in District VIII desert clearing boulders from State Highway.

FOREMAN Wm. Neilson and his crew have adopted seasonable costumes for the desert. They look something like old-fashioned, modest bathing suits, though the distance is 250 miles from the seashore in the middle of the desert. The temperature has been hovering around 120 degrees.

ADDRESSES ASSESSORS' CONVENTION

Herman D. Jerrett, right of way agent for District X, headquarters, Sacramento, was one of the principal speakers at the Convention of County Assessors, held recently at Eureka. Mr. Jerrett's talk appeared in the August 23d issue of the Eureka Standard and contained much information of value gained by the speaker in his years of service for the Division of Highways.

His principal points were that, owing to the wide variance of opinion as to values, trained men for the gathering of valuation data have become necessary and that the fixing of values was a distinct work in itself and should be left to assessors. The training attained by valuation men, he said, enabled them to plat various acreages, soil and crop changes, quality of soil, age, condition and variety of orchards and vineyards and other permanent crops; also to make records showing dimensions, type, obsolescence or age of building improvements, topographical, traffic and other conditions affecting urban properties, all of which furnishes an abundance of data from which assessors can intelligently fix values.

WHAT THE DISTRICTS ARE DOING

DISTRICT III.

HEADQUARTERS, SACRAMENTO.

F. W. HASELWOOD, DISTRICT ENGINEER.

Counties of Butte, Colusa, El Dorado, Glenn, Nevada, Placer, southern Plumas, Sierra, Sutter, Yuba, and northern Sacramento and Yolo.

Sylvan School to Roseville.

The Sylvan school to Roseville asphalt concrete two-story job was awarded to J. C. Compton. Mr. Compton advises that he is now shipping his outfit down from Oregon and expects to start working about the first week in September.

Rock Border for Pacific Highway.

A district contract was advertised on August 22d for the placing of 11.8 miles of water-bound rock borders on the state highway, road III Col.-7-B&C between Williams and Delevan.

Willows to Biggs.

A district contract was advertised for the placing of rock borders and bituminous macadam surface between Four Corners and Butte City. This work is to be done on a fifty-fifty basis with Glenn County.

Wedding Bells.

District III announces the launching of another ship of matrimony in the marriage of Miss Grace Staats on August 14th to Edwin Bercher.

DISTRICT V.

HEADQUARTERS, SAN LUIS OBISPO.

L. H. GIBSON, DISTRICT ENGINEER.

Counties of San Benito, Monterey, San Luis Obispo, and Santa Barbara.

AFTER OILING.—A portion of the Cholame Lateral following oiling by the "mixing" method.

District V maintenance forces have completed a very successful oiling job on the Cholame lateral, Route 33, from Paso Robles to Shandon. Both the "mixing" and "surface" methods were used, the former on the western end of the job near the town of Shandon and the latter on the eastern portion, from Estrella River bridge west.

DISTRICT VI.

HEADQUARTERS, FRESNO.

E. E. WALLACE, ACTING DISTRICT ENGINEER.

Counties of Fresno, Madera, Merced, Mariposa, Kings, Tulare, and Kern, north of the Tehachapi.

Reconstruction For Valley Route.

On July 28th, the Commission awarded two reconstruction contracts involving widening of roadway to 30 feet and resurfacing with asphalt concrete to a width of 20 feet, between Lerdo and one mile south of Delano, in Kern County, a distance of 18.5 miles. On the southerly contract from Lerdo to one mile north of Famosa, 9.1 miles, the low bidder was Force, Currigan and McLeod. On the other section of 9.4 miles, the Valley Paving & Construction Company were the successful bidders.

Convict Camp Moved.

The convict camp which has been located in the Merced River Canyon at Bloss for several years, is now being moved to a point about six miles north of Mariposa, on the Merced-Yosemite lateral. For the next five months, this crew will be engaged in work of realigning the roadway between Mariposa and eight miles north. The convict force will approximate 100 men.

Investigate Kings River Canyon Route.

During the week beginning July 24th, a reconnoisance trip to the Kings River Canyon, Tehipite Valley and Granite Pass, in Fresno County, was made by F. J. Grumm, Engineer of Surveys and Plans, headquarters office, and E. E. Wallace. A preliminary investigation was made of the continuation of re-routing of the present highway through Hume, known as Route 41. About 1912, a road was constructed by the State Department of Engineering between General Grant Park and four miles east of Hume. This department also made reconnoisance surveys for continuing a future road down the Kings River and following same easterly to the Kings River Canyon. The scenic beauty and resources of this country were an agreeable surprise.

The expedition was sponsored by the Fresno County Chamber of Commerce, and was exceedingly well conducted. The party consisted of 15, besides packers and cooks.

Personal Items.

P. L. Wilcox has been assigned as resident engineer on Contract 96FCI south of Famosa.

H. B. La Forge has been assigned resident engineer on the contract between Delano and Famosa.

DISTRICT VII.

HEADQUARTERS, LOS ANGELES.

S. V. CORTELYOU, DISTRICT ENGINEER.

Counties of Los Angeles, Ventura, Orange, San Diego, and eastern Kern, south of Mojave.

More Wedding Bells in District VII.

L. M. Ransom, Assistant Division Engineer, announced that he was going on a vacation and, stealing a march on his many friends became a happy benedict. Mrs. Ransom was Mrs. Grace Ryan of Los Angeles.

L. C. Cline, another District VII employee, has also joined the married ranks. His bride was Miss Witcher of Oceanside.

Coast Highway Paving.

Work on the reconstruction of the portion of the Coast highway in Ventura County, between Ventura and the Santa Barbara County line, is progressing rapidly. About 9½ miles of the new concrete pavement is now in place, and all grading and culvert work is practically completed.

San Diego Paving Open to Traffic.

On the La Mesa to El Cajon reconstruction job in San Diego County all concrete pavement is completed and open to traffic.

Completing Orange Job.

All concrete pavement has been completed and opened to traffic, and work is in progress on the rock borders, on the contract for placing 1.5 miles of pavement between Naples and Anaheim Bay bridge, on the Coast highway in Orange County.

DISTRICT VIII.

HEADQUARTERS, SAN BERNARDINO.

E. Q. SULLIVAN, DISTRICT ENGINEER.

Counties of San Bernardino, Riverside, and Imperial.

Determined to Protect Its Workers From Reckless Drivers.

A number of avoidable traffic accidents, in which several of its employees were badly hurt, has caused the officials of District VIII to come to the determination that protection must be afforded its highway workers. Immediately following the accidents warrants for the arrest of the offenders were secured and the authorities are giving a full measure of cooperation.

A truck driver who ran through "Slow" signs, over a "Men at Work" sign and through barricades, injuring two workers, is now serving a 90-day sentence after paying a fine of $250. He began his term before nightfall of the day of the accident. A bus driver, who broke both legs of another Division VIII man, is now a fugitive from justice.

DISTRICT IX.

HEADQUARTERS, BISHOP.

F. G. SOMNER, DISTRICT ENGINEER.

Counties of Inyo, Mono, and eastern Kern County, north of Mojave.

MAIN STREET, Bishop, District IX; Oiled in 1926 with Penetration Method.

Oiling In District IX.

The oiling program, limited to 14 miles, 4 miles between Lone Pine and Independence and 10 miles to the north of Independence, is well under way.

Drainage System Completed.

The construction of paved dips, twelve in number, between Mojave and Red Rock Canyon, was finished August 13th. R. C. Payne was in charge. This improvement marks the completion of a much-needed drainage system, supplying proper cross-drainage to ditches paralleling the highway, thus controlling the waters from frequent cloudbursts in the mountains and flows from the spillways of the Los Angeles City Aqueduct.

Los Angeles City to Build Bridge in District IX.

Bids were opened on August 8th for the grading of 21 miles between Coso Junction and Olancha, Inyo County. R. C. Payton of Norwalk was the low bidder.

An important unit included in this improvement is the erection of a steel span across the Los Angeles City Aqueduct, replacing a timber structure on a dangerous curve. The city authorities are to be commended for their prompt action in providing this structure in advance of the grading operations.

Contemplated Work.

Grading on Route 23, Dogtown to Point Ranch, distance of 3.65 miles, is now contemplated.

Funds have been provided for the surfacing with crushed rock of a stretch of two miles in Inyo County, south of Independence. The work will be done by state forces.

DISTRICT X.

HEADQUARTERS, SACRAMENTO.

R. E. PIERCE, ACTING DISTRICT ENGINEER.

Counties of Amador, Calaveras, Alpine, Tuolumne, Stanislaus, San Joaquin, Solano, and southern Sacramento and Yolo counties.

Mr. R. E. Pierce, Acting District Engineer of District X, is vacationing with his family at Bijou.

C. J. Temby has just returned from a delightful vacation spent in southern California. Accompanied by his family he motored to Los Angeles via the Coast route. While on the return trip he visited the Oakland air port and saw the planes which were entered for the Dole Hawaiian flight.

Miss Julia Terra is a comparatively recent addition to the District X accounting force.

J. F. Kerins, clerk attached to District X, spent a joyous vacation at Santa Cruz.

J. F. O'Hara, formerly of Headquarters office, but more recently affiliated with District VIII, has been transferred to District X.

Messrs. Eugene Sorin and Harry Webb, draftsmen in the District X office, were among the national guardsmen who recently enjoyed two weeks of camp life at Monterey.

HIGHWAY NEWS NOTES

Foreman T. M. Joyce, employed since April, 1924, has been transferred from Sonora in District X, to Korbel, Division 1.

Henry Stroder has been promoted to foreman and assigned to Eureka, Division 1. Since 1918 he has been working in District X.

H. P. Grove until recently working out of Stockton, has been transferred to Trinidad, District 1, where he takes a foreman's position.

F. R. Baker, formerly resident engineer in District III and more recently resident engineer on the Sand Hills job in District VIII, has been transferred to this district to supervise the Sylvan-to-Roseville reconstruction. Arthur Wallace and J. N. Hollister, assistant resident engineers, accompany him.

LOCAL ENGINEER'S WORK RECEIVES ATTENTION.

The Bridge Department is in receipt of a letter from R. B. Wright, Highway Bridge Engineer, for the Bureau of Public Roads, District No. 1, calling attention to an illustrated article by H. D. Stover, Associate Bridge Engineer in charge of designs, showing and describing graphic charts and their uses in bridge designing. He desires duplicate copies of the charts.

The above is an index as to the value of "California Highways" as a disseminator of engineering information, not to mention encouragement it offers our engineers to improve in their profession.

STATE HIGHWAY FUND CONTRACTS (Bond Funds, Including Federal Aid)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE JULY 28, 1927.						
443-A	I	Del Norte	1	A	Across Klamath River		Repairing Bridge	California Air Const. Co.	$54,748 41	Nov. 9, 1926	------
519	VII	Orange	60	B-C	Through Laguna Beach	1.54	Grading and P. C. C. Pavement	United Conc. Pipe and Const. Co.	70,012 13	Jan. 3, 1927	------

NOTE.—Primary construction covered by the above contracts does not include funds obligated on co-operative forest highway projects, prison camp road activities, or day labor jobs not being done under contract.

STATE HIGHWAY MAINTENANCE FUND CONTRACTS (Including Gasoline Tax Fund)

Cont. No.	Division	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE JULY 28, 1927.						
M-161	VI	Merced	4	A	Between Athlone and the Southerly Boundary	4.51	Widen with P. C. C. and Surf. with Asph. Conc.	Allied Contractors, Inc.	$105,706 13	Mar. 9, 1927	------
M-158	X	San Joaquin	5	B	At Mossdale Bridge	0.26	Constructing approaches	J. E. Johnston	32,272 99	Feb. 7, 1927	------
					AWARDED SINCE JULY 28, 1927.						
95FC1	V	Santa Barbara	2	J	Monteeito to Summerland	1.42	Portland Cement Concrete Pavement	Sam Hunter	$67,337 66	Aug. 16, 1927	------
97FC3	VII	Orange	2	B	1 mile north of Galivan to 6.7 miles North of Galivau	5.7	Grading and P. C. C. Pavement	George Herz Company	223,757 03	Aug. 16, 1927	125
911FC1	VII	Orange	2	B	Over the A. T. and Santa Fe R. R. near Galivan		R. C. Girder bridge	Hewitt-Miller-Shirey	32,599 12	Aug. 29, 1927	150
94EC2	IV	Alameda	5	B	Between Dublin and Hayward	7.6	Bituminous Macadam Surface	Ariss-Knapp Company	415,273 18	Aug. 18, 1927	250
93EC1	III	Placer	38	A	Across Blackwood Creek		R. C. Culvert, Parapet and Wing Walls	Frank A. Holdener	6,333 75	Aug. 20, 1927	75
93EC2	III	Sacramento-Placer	3	B,A	Between Sylvan School and Roseville	3.1	Asphalt Concrete Pavement	J. C. Compton	105,742 15	Aug. 23, 1927	120
99FC1	IX	Inyo	23	H,I	Coso Junction to Olaucha	21.3	Grading and Structures	F. C. Payton	38,663 26	Aug. 29, 1927	150
911EC7	X	Sacramento	4	A	Two Bridges North of Arno		Two R. C. Girder Bridges	M. A. Jenkins	22,370 62	Sept. 2, 1927	175
97FC2	VII	Los Angeles	61	A	Retaining Walls Aroyo Seco		R. C. Ret. Walls for Flood Protection	J. W. Breedlove, Inc.	12,531 25	Sept. 2, 1927	100

NOTE.—The above obligations charged against the State Highway Maintenance Funds do not include funds from these sources obligated for general maintenance and for specific betterments being done under day labor authorization.

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CALIFORNIA HIGHWAYS

A BULLETIN ISSUED BY THE DIVISION OF HIGHWAYS FOR THE INFORMATION OF ITS EMPLOYEES AND THE PUBLIC

Vol. 4 SEPTEMBER-OCTOBER, 1927 No. 9

BEAUTY AND UTILITY—One of California's most beautiful state highway scenes, a portion of the Peninsula highway in San Mateo County. It has handled so much traffic in late years that other routes are now being surveyed and constructed to relieve its congestion.

In this issue: BREAKING SAN FRANCISCO'S STATE HIGHWAY BOTTLENECK, PAGE 3.

CALIFORNIA HIGHWAYS

This Bulletin is published by the California Highway Commission for the information of its employees and the public. Editors of newspapers and others interested are welcome to use, without restriction, any of the matter herein contained. Cuts will he gladly loaned upon request.

J. P. HALL - - - - - Editor
P. O. Box 1103, Sacramento, California.

Vol. 4 SEPTEMBER-OCTOBER, 1927. No. 9

CALIFORNIA DIVISION OF HIGHWAYS

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B. B. MEEK, Director of Public Works.

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C. S. POPE, Construction Engineer
T. H. DENNIS, Acting Maintenance Engineer
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R. H. STALNAKER, Equipment Engineer
C. L. McKESSON, Materials and Research Engineer

WILLIAM SCHLEIP, Principal Accountant
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H. S. COMLY, District II, Redding
F. W. HASELWOOD, District III, Sacramento
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L. H. GIBSON, District V, San Luis Obispo
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S. V. CORTELYOU, District VII, Los Angeles
E. Q. SULLIVAN, District VIII, San Bernardino
F. G. SOMNER, District IX, Bishop
R. E. PIERCE (Acting), District X, Sacramento

General Headquarters, Third Floor, Strub Bldg., Eleventh and P Streets, Sacramento, California.

EVERY employee of the highway commission has a direct interest in the improvement of the highway organization's methods and results, both engineering and clerical, office and field. To that end, the State Highway Engineer invites constructive criticism or suggestions from every employee.

Ideas as to the more economical and efficient handling of your job, or suggestions for elimination of waste will be welcomed. Criticism is also desired from persons outside the organization, who are in a position to give facts.

Send only signed communications addressed as follows: California Highways, P. O. Box 1103, Sacramento, Cal.

GOOD TIMBER!

The tree that never had to fight
For sun and sky and air and light,
That stood out in the open plain,
And always got its share of rain,
Never became a forest king
But lived and died a scrubby thing.
The man who never had to toil,
Who never had to win his share,
Of sun and sky and light and air,
Never became a manly man
But lived and died as he began.
Good timber does not grow in ease;
The stronger wind, the tougher trees;
The farther sky, the greater length;
The more the storm, the more the strength;
By sun and cold, by rain and snows,
In tree or man good timber grows.
Where thickest stands the forest growth
We find the patriarchs of both,
And they hold converse with the stars
Whose broken branches show the scars
Of many winds and much of strife—
This is the common law of Life.

—Selected.

THE SHORTEST DISTANCE.

Highway construction of recent years has taught the country much about road building. Highway engineering has become a highly specialized branch of engineering chiefly because modern methods of road construction demand exact supervision and planning.

One thing highway engineers have learned is that every foot a highway is shortened represents a considerable saving for the taxpayer and road users. The taxpayer saves because it means less road to build and maintain, while shortening the way results in economy and time saving for the traveler.

The old notion that a few extra miles do not matter so long as the road is good has been abandoned by all but the seekers after the longest route home.

An engineer points out that a curve with a 200-foot radius makes a road 86 feet shorter than if the road were permitted to follow the old square corner of the survey lines. Multiplying this by the number of sharp turns in the average old-style highway vindicates the road-straightening policies of the state highway departments.

Now that the motor truck is so extensively used for the transportation of food and other commodities for public consumption shortening the highway distance between the shipping point and destination means lower living costs through reduced cost of transportation. Railroads spend millions annually to find, for their tracks, the shortest distance between two points, and the saving is not for them but also for their patrons.

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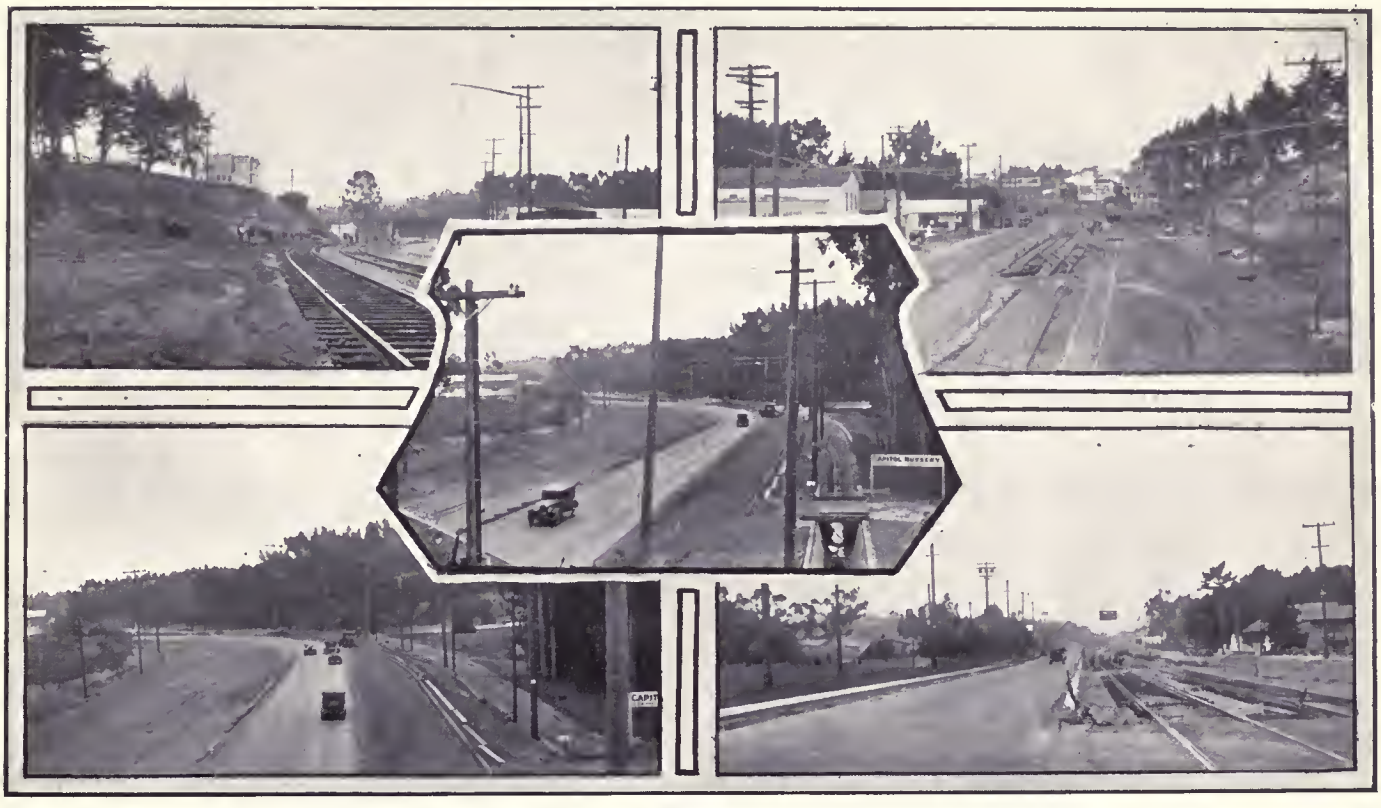
SEPTEMBER 1927

California Highways

VOL. 4 NO. 9

Breaking San Francisco's State Highway Bottleneck



BREAKING THE BOTTLENECK—(1) Looking south to S. P. Underpass; Completing grading work. (2) South from S. P. Bridge; Old 24-foot pavement near center. Header boards being set for concrete pavement. (3) North from S. P. Bridge car tracks being moved to center of right of way. (4) Progress in widening work in front of Cypress Lawn Cemetery. Old 24-foot pavement on left or west side of car track to be widened and resurfaced. Car tracks being reballasted. Rough grading completed on right or east side. (5) South from S. P. tracks showing storm drain.

THE widening and paving of San Francisco's only state highway outlet to the south will soon be completed and the breaking of the notorious Colma "bottleneck" accomplished. Although the date for the completion of the contract is set at November 1, 1927, it is thought by California State Highway officials that an earlier date will see the opening of this fine new section of the El Camino Real.

Six traffic lanes, three in each direction, separated by the tracks of the peninsula electric cars, will in future carry the automotive traffic with increased safety and speed from San Francisco into San Mateo County and to all points south. The tracks of the Market Street Railways Company will occupy the center 28 feet; a 10-foot easement, unpaved, will run between each traffic artery and the street car line as an added precaution against accidents, and two 10-foot strips will be reserved for sidewalks.

A $700,000 Project.

In round figures the cost of the 1½ miles of reconstructed highway will approach a sum of $700,000, exclusive of engineering costs. Figures for the project are as follows:

Cost of right of way	$165,000
Grading and realigning	137,000
Paving	209,000
Cost of moving railway	110,000
Other improvements	53,000
Total	$674,000

A Cooperative Project.

Agreements with City and County of San Francisco for an appropriation of $150,000 with the county of San Mateo for $50,000, and with the Market Street Railways Company for $55,000, and the untiring support of the various county and municipal authorities made it possible for the California Highway Commission to award the contract for the grading and structures of this portion of the state highway from Colma to Cypress Lawn Cemetery. The award was made on October 7, 1926, to the Kaiser Paving Company.

Many months were required by the contractors in moving a large number of buildings and other obstructions, and it is only recently that the entire project has taken shape of the new alignment. The setting of poles, including those of the

(Continued on page 5.)

California Highway Engineers Attend Denver Convention

FOUR of California's highway engineers, State Highway Engineer R. M. Morton, Assistant State Highway Engineer T. E. Stanton, Construction Engineer C. S. Pope, and Acting Maintenance Engineer T. H. Dennis, were in attendance at the annual convention of the American Association of State Highway Officials held at Denver, Colorado, October 3d to 6th.

This association is comprised of state highway engineers and officials of all of the states of the union, and it is this organization which has been largely responsible for important national highway legislation, and individually the members have been mainly responsible for state highway legislation and development in the states which they represent.

California Engineer Among Speakers.

One of the principal addresses was delivered by T. E. Stanton on the subject of "Bituminous Treatment on Gravel and Stone Roads." Mr. Stanton went thoroughly into the subject, telling of the work on state roads in California with the use of our two oiling methods, namely: mixing and penetration. The results obtained during the past two years in oiling state roads have attracted attention in all states of the union and Mr. Stanton was able to give the assembled delegates some first hand information that will prove very helpful to them in their future road building. He laid emphasis on the reasons that oiled roads have proven so successful in the state highway system of California, these being the elimination of dust, the resultant smooth riding macadam surface, and the several years service obtainable before paving is necessary.

A request that congress at its next session shall continue its yearly appropriation of $75,000,000 federal aid funds for the years 1929 and 1930 for the improvement of highways within states, and a request that congress also appropriate larger funds for the roads in national forests serving as approaches to national parks featured the meeting of the National Association of State Highway Officials.

The eleven western states were emphatically in favor of larger appropriations for major highways in the national forests. The officials from the western states declared that major road improvement in the national forests was lagging behind the improvement of state highways, federal aid highways and highways within the national parks, to which latter roads, the roads in the national forests serve as approaches.

The consensus of opinion was that the appropriation for the national forest material roads should be increased from $7,500,000 to $15,000,000 a year. The convention went on record as favoring a substantial increase, without, however, fixing the amount of increase asked.

The last authorized appropriation of federal aid money for the improvement of roads within states falls due in 1928. The convention requested congress at its next session to indicate its intention of continuing the policy of federal aid by appropriating $75,000,000 a year for the years 1929 and 1930. There was some agitation to ask for a larger amount, but the convention finally decided to ask for the $75,000,000 appropriated in the last federal aid measure.

Much attention was devoted to increasing the safety factor on highways through better alignment, and through the installation of safety stop systems. Traffic stripes at the center of the roads at points of danger were also advocated. One state announced a system of a broken line along the center of the highway where the danger was small, and a solid stripe at curves, bridge approaches or points of poor visibility.

A largely increased resort to the gasoline tax as a means of financing highways was also reported.

Other subjects on which addresses were delivered are: "State Highway Departments' Responsibility in the Protection of Life and Property," "Federal and State Court Decisions Affecting Highways," "Suggested Changes in Bonding and Contracting Practices on Highway Construction," "Federal and State Control of Interstate Busses and Trucks."

Entertainment Features.

Tuesday evening members of the association were guests of honor at a dinner given by the Colorado Good Roads Association. Addresses were made by several governors and members of the United States House of Representatives. On the afternoon of October 5th the delegates and their families were guests on a 70-mile automobile trip over the scenic highways through the Denver mountain parks in the Rocky Mountains adjacent to the city.

Owing to the rapid development of new methods and practices in highway building in the various states the program of this convention was of unusual importance, the delegates bringing back with them much useful information for future work.

IT PAYS TO DRIVE ON HARD ROADS

Average gasoline consumption was reduced from 521 to 454 gallons per car per year as a result of highway paving done in North Carolina in the year from July, 1922, to July, 1923, according to B. C. Frost, as quoted in a statement made at a recent meeting of the Northern California section of the Society of Automotive Engineers in San Francisco. This reduction of 67 gallons of fuel consumption per car per year amounts to a saving of $16.75 per car with gasoline selling at 25 cents a gallon.

Records of an automobile dealer in Illinois who operates a drive-your-self service and separates his cars so that some were operated almost wholly on hard-surface pavements and others on country roads, showed, according to a statement by A. J. Eddy, a civil engineer of Berkeley, Cal., that the authority states that an owner would save 2.6 cents a mile the hard-surface highway. An estimate made by another authority, states that an owner would save 2.6 cents a mile by driving on hard-surface roads rather than on dirt roads.

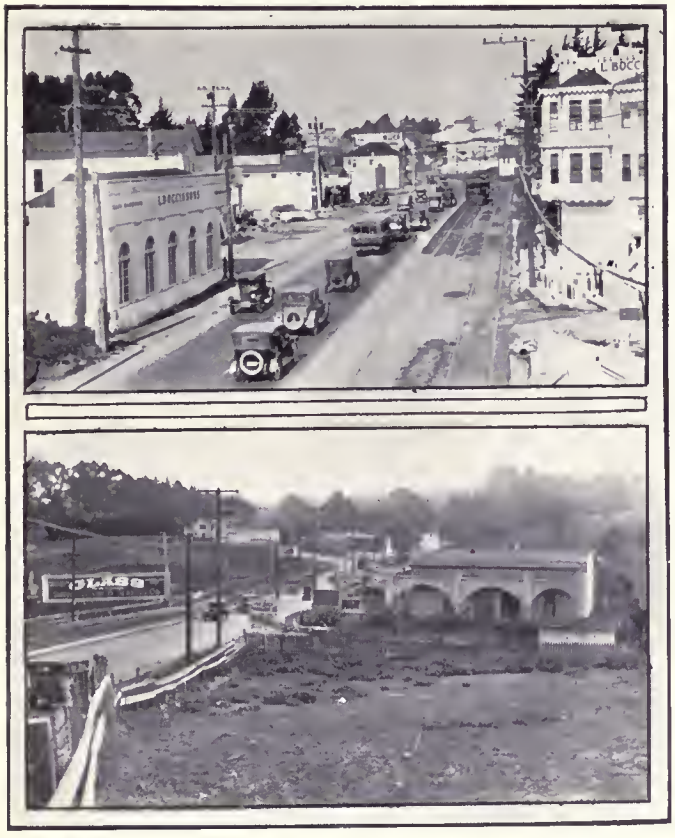
Taking the mean of these estimates and assuming that the owner saves 2½ cents a mile and drives 5,000 miles per year, his saving would exceed $125 a year. Although no data were available on motor trucks, the saving may amount to as much as 5 cents a mile.

Not only does the automobile owner save money as the result of hard road construction, but the taxpayers of the county and state also save money in the long run through the building of durable types of highway. Mr. Eddy cited as an instance of this an oiled macadam pavement whose maintenance cost the city of Berkeley $1,645 a mile per year during a two-year period, while a pavement that has an 8-inch concrete base and an asphalt surface cost only $53 per mile per year during the same period, or slightly more than 3 per cent as much, for maintenance.—Highway Engineer and Contractor.

BREAKING SAN FRANCISCO'S STATE HIGHWAY BOTTLENECK

(Continued from page 3.)

Market Street Railways, and the telephone and telegraph lines back of the proposed curb line, and the moving of all old poles in the old right of way, has made a marvelous appearance in this new line. The Market Street Railways Company has been very busily engaged in moving their tracks to the center line of the new right of way and reballasting and placing new ties.



MOVING BUILDINGS A BIG ITEM—*Upper*, North from S. P. trestle before moving the buildings and widening. *Lower*, From Colma looking south, showing buildings before moving.

Traffic Maintained.

There has been little or no interruption in traffic during construction. Particular care was always taken to see that detours were of adequate width and properly surfaced to avoid congestion or inconvenience to the traveling public. The width of the former pavement provided only a 24-foot surface for both north- and south-bound traffic. This 24-foot strip is still in place in a number of locations in the project and it is a strange sight on a Sunday afternoon to see the broad and clear expanse of the 124-foot right of way void of buildings, while the narrow 24-foot old pavement is jammed with traffic. A sight of this nature certainly reveals the value of a widened and straightened highway capable of handling the heavy Sunday and holiday traffic and the usual week-day run of heavy trucking and other vehicles.

Paved With Cement Concrete.

As soon as grading operations had been completed to a point where it was advisable to proceed with the paving, plans and specifications were prepared and bids were received on June 13, 1927, to pave the project, 1½ miles in length, with Portland cement concrete. Some of the major items of the paving contract are:

435,000 square feet preparing and shaping subgrade for pavement.

13,000 cubic yards Class "A" Portland cement concrete in pavement.

390,000 pounds reinforcing steel in pavement and curbs.

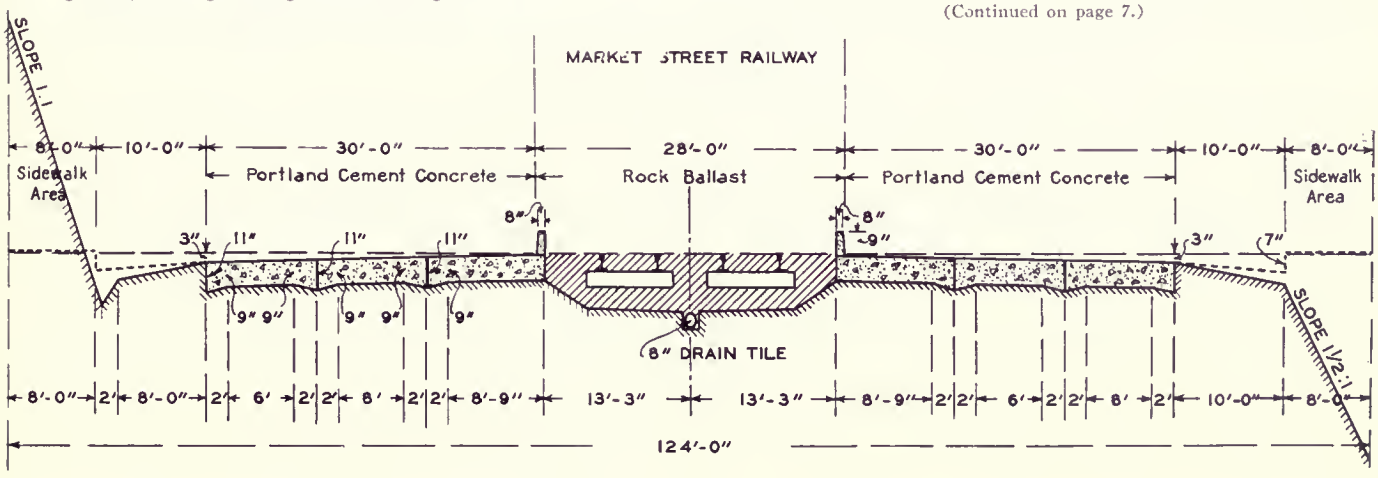
1600 tons of asphaltic concrete mixture repairs and thickening of asphaltic surface on portions of the old pavement within area of new improvement.

These major items are a portion of a contract awarded to Hanrahan Company of San Francisco, June 23, 1927. The contract specifies that all work shall be completed within 75 days after the approval by the attorney for the Division of Highways, whose approval on July 25, 1927, sets the date for completion on November 1, 1927.

Traffic Way 124 Feet In Width.

The improvement provides for work within the entire width of right of way of 124 feet. The reballasted and realigned

(Continued on page 7.)


SLOPE 1:1
MARKET STREET RAILWAY
8'-0" Sidewalk Area
10'-0"
30'-0" Portland Cement Concrete
28'-0" Rock Ballast
30'-0" Portland Cement Concrete
10'-0"
8'-0" Sidewalk Area
8" DRAIN TILE
SLOPE 1½:1
8'-0" 2' 8'-0" 2' 6' 2' 2' 8' 2' 2' 8'-9" 13'-3" 13'-3" 8'-9" 2' 2' 6' 2' 2' 8' 2' 10'-0" 8'-0"
124'-0"

TYPICAL CROSS SECTION
COLMA TO CYPRESS LAWN CEMETERY
DIST. IV-S.M. 2 A. CONTRACT NO. 94 EC I
SCALE HORZ 1 INCH - 12 FEET
VERT 1 INCH - 4 FEET

Valona Slide Conquered With Concrete Slope Paving

THE VALONA SLIDE CONQUERED—Over an acre of cement concrete now will keep the Contra Costa hills from sliding the state highway at Valona into Carquinez Straits. The new $8,000,000 Carquinez highway toll bridge appears in the view.

AT LAST the Valona Slide appears to be conquered. For years it has been a source of trouble and at one time literally shoving the concrete pavement over a cliff for a fall of at least 100 feet to the tracks of the Southern Pacific railroad which skirts the base of the sliding hill.

The formation at this point, a short distance west of Crockett, and the south approach of the Carquinez highway toll bridge, appears to have no solid foundation and when well saturated with water during the winter, moves in a solid mass.

Cemented With Gunite.

The sliding hill has been given a 2-to-1 slope, and after being smoothed by hand work was paved with 2 to 2¼ inches of gunite.

Gunite is a very fine mix of sand cement and water, laid under air pressure by a cement gun. The sand and cement are mixed under pressure and led to the job through a hose under pressure. Just before it leaves the nozzle to be shot onto the job, the dry mix receives the water, properly proportioned. Eight sacks of cement were used to the cubic yard.

Construction Details.

Before placing the gunite, tile drains were installed. The pavement was placed in rectangular slabs, separated with premoulded bituminous composition strip, one-half inch thick. The slabs were reinforced with wire fabric, No. 8 gauge, spaced 4 inches apart. The reinforcing was held in place by means of concrete or metal chains. Each slab was attached to the subgrade with 4 cement concrete anchors, 6 inches in diameter and 2 feet 6 inches long, reinforced with deformed bars. To cure the slope it was covered with burlap and uniformly sprinkled with a fine mist for four days.

The whole slope contains 44,560 square feet, or slightly more than an acre of concrete. A. Tiechert & Son had the contract.

WHERE SNOW REMOVAL IS A REAL PROBLEM

Michigan is confronted with the problem of keeping more of her state highways open in the winter, having recently adopted a program calling for snow removal on an additional 942 miles over last year, bringing the total to 6629 miles. The additional mileage calls for $50,000 worth of added equipment and 600,000 lineal feet of snow fence at a cost of $100,000.

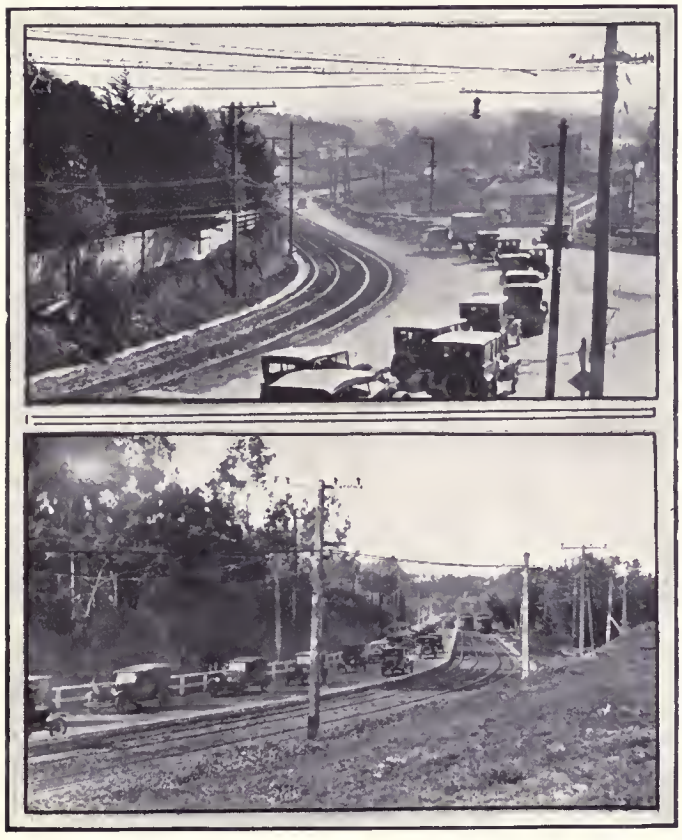
GRADE CROSSING ACCIDENTS IN 1926.

The American Railway Association reports an increase in grade-crossing accidents during 1926. Throughout the United States there were 5921 crossing accidents last year, in which 2492 persons were killed and 6991 injured, while in 1925 there were 5479 accidents in which 2206 persons were killed and 6555 injured.

BREAKING SAN FRANCISCO'S STATE HIGHWAY BOTTLENECK

(Continued from page 5.)

street railway tracks of the Market Street Railways Company are on 13-foot centers and occupy the central 28 feet of the right of way. These tracks are ballasted in rock under which is laid a 6-inch longitudinal tile drain for draining the track area. The completed open ballasted railway tracks will remain in this condition and will be curbed to prevent vehicle traffic from driving onto the area reserved for street car tracks except at specified paved crossings which provide for cross travel.



TRAFFIC SCENES ON THE OLD HIGHWAY—*Upper,* From Colma looking south, showing heavy traffic on old road before reconstruction. *Lower,* View of old road with car tracks near Eternal Home Cemetery. This portion of road has been eliminated entirely by line change.

Sixty Feet of Paving.

On each side of the central 28-foot strip reserved for the railway tracks, there is being constructed a 30-foot Portland cement concrete pavement, consisting of three 10-foot strips, nine inches thick in the central six feet and increasing from nine inches to 11 inches in the outer two feet. The slab adjacent to the center is being constructed 10 feet 9 inches wide, the additional nine inches being for support of concrete curb doweled to the pavement base.

Construction Details.

Expansion joints are provided for at 60-foot intervals and consist of prepared bituminous joint. Concrete slabs at expansion joints are doweled with five ¾" x 24" dowels and 27-inch centers, one end being fixed, the opposite end being a slip joint. At 20-foot intervals between expansion joints a transverse weakened plane is being constructed obtaining a true transverse natural crack line; therefore each 10' x 20' portion of pavement is separately reinforced with two ⅝" deformed reinforcing bars laid four feet from each of the four edges of the slab. A portion of the previously constructed state highway will be used as a base for the new improvement. The old width of 24 feet will be increased six feet to a total of 30 feet by the construction of a concrete shoulder 10 feet wide, four feet of it overlapping the asphaltic pavement and raised to the elevation of the new crown. The remaining portion of the area over the old pavement will be resurfaced with asphalt concrete and finished to a true cross section conforming to the standard provided in contract.

In order to facilitate the rapid placing of concrete pavement, Hanrahan and Company have constructed bunkers and proportioning plant on the railroad siding adjacent to the center of their work. All materials are loaded in dry-batch compartment trucks and hauled directly to the subgrade where a six-sack Multifoote paver receives the material and places the concrete directly in 10-foot width sections. It is the purpose to lay the concrete pavement on this line change for the immediate use of traffic and to allow the moving of the railway tracks from the old location to the new right of way, at the same time obviating two dangerous crossings of these street car tracks. Traffic will be routed over one or another of the 10-foot strips which will permit of the pouring and curing of other pavement sections on opposite sides.

This particular highway, Route 2, carries the largest amount of traffic of any road in the state as shown by a 16-hour count taken Sunday, July 17th. It is quite probable that this figure will exceed 30,000 when this improvement is completed and the entire highway thrown open to traffic, which will then give the autoists an unobstructed traffic artery between San Francisco and points south.

Right of Way.

Securing the right of way for this project was the most difficult and costly piece of work along this line undertaken in this district, and, it is believed, in the entire state. Though less than a mile and a half in length, dealings were had with hundreds of people. Whole families had to be interviewed en masse and later as separate individuals, together with their spiritual advisers, attorneys and friends. Appraisals had to to be made on the moving of numerous dwellings, several road-houses, garages, service stations and monument works. This involved appraisals of the most diverse character and the patience of both the appraisers and the owners was many times at the breaking point, but now that the job is finished it may be truthfully said that amicable relations are in force between the district office and our neighbors along the highway.

The total cost of the right of way will approach $165,000, there being still a few unsettled deals for property and building removals. This cost includes the work done directly by the state as well as monetary damage paid to the owners.

The district office was very fortunate in having the able assistance of the Right of Way Department of the Department of Engineering of the City and County of San Francisco for a large portion of the negotiations.

Don't Spread This.

Si—"Sara, is there anything you want from town this mornin'?"

Sara—"You might stop in at one of them there stores and buy a jar of that there Traffic Jam I been ahearin' so much about."

COST OF SNOW REMOVAL FROM STATE HIGHWAYS

By W. A. Smith, Assistant Maintenance Engineer.

THE Maintenance Department recently collected some information for the United States Bureau of Public Roads relative to the extent and cost of snow removal from our highways during the 1926-1927 season. It is felt that this information may be of interest to many who are interested in this branch of state highway work.

A summary of reports from the several districts shows that 299 miles of state highways were cleared of snow. Of this total, 251 miles were kept open in Districts II and VIII and the remaining 48 miles were opened to travel by Districts III and IX forces earlier than if nature had been allowed to take her course. One 12-foot rotary snow plow, eight straight-blade plows, fourteen trucks, fourteen tractors and fourteen graders were available for the work.

The cost of keeping the above mileage open was $15,970 and of opening the 48 miles was $6,180, a total expenditure of $22,150 for the work.

District VIII records indicate that 7600 mile-inches of snow were removed at a cost of $1.58 per mile-inch.

URGE CHEMISTS TO DEVISE A METHOD TO CHANGE CLAY INTO SAND.

A challenge to chemists to discover a method by which clay materials could be given the characteristics of sand was made by Charles M. Upham, Director of Highway Research of North Carolina, before delegates attending the American Chemical Society convention in Detroit. The saving to road builders, he said, would amount to millions of dollars.

"I know of no greater service," he said, "that the chemist can render than to perfect a process by which clay may be treated, changing its nature so that it can be drained, and reduce to a minimum the volumetric changes when subjected to various amounts of moisture and increase the bearing value under moist conditions and render it into a material that could be shaped and maintained by road machines."

TRANSCONTINENTAL HIGHWAY SUGGESTED.

Survey for a super-highway from the Atlantic to the Pacific was suggested in a bill introduced by Senator Dupont, Republican, of Delaware.

The road would be by the most direct route and touch cities of more than 2500 only where impractical to go around them.

Damaged Goods.

Insurance Agent: "Come with me, you can get damages for this."

Negress (hit by truck): "Good Lawd, man, ah don't need no mo' damages. What ah needs is repairs."

Steering Wheel Observations.

There are really only two great questions before the American people today: how to pay and where to park. It is almost impossible for anybody to land in the gutter any more, not because of prohibition, but because some other fellow has already landed there. What this country needs isn't more freedom, but more free parking space.

The men who laid out our towns certainly didn't provide for the automobile. They should have made four curbs on every street; and why all the houses; Nobody stays home any more, or any more than we can help. Home is just a place to go to get money for gas. Home is just a place to go to start from.

If all the automobiles in the United States were put end to end and on Sunday they are. A line of automobiles is as hard to pass as good legislation. About the only road that isn't jammed on Sunday is the road to church. There is plenty of room to park in the pews, but nobody ever thinks of that.—Santa Fe New Mexican.

THE GRADE CROSSING GRAVEYARD

In the United States 22,006,957 automobiles are registered. There are 232,755 railroad-highway crossings.

In 1926 there were 2492 persons killed and 6991 injured at railroad-highway crossings. In the same period 20,819 were killed and 600,000 injured in automobile accidents upon our highways.

The elimination of railroad-highway crossings at grade would end crossing accidents. Generations of time and $19,000,000,000 are involved in this project.

Ratio of Killed and Injured to Automobiles Registered.

One fatality at railroad crossings to 11,201 cars.

One fatality on highway to 1001 cars.

One injury at railroad crossing to 2381 cars.

One injury on highway to 39 cars.

All public crossings are marked by crossing signs. Many have advance warning signs.

Two hundred two persons were killed and 1430 injured by running into sides of trains last year. Automobile accidents at railroad crossings resulted in the death of 50 and injury to 69 passengers and employees *on trains.*

Railroad enginemen are trained, selected, disciplined.

Are automobile drivers — — — ?

Recommendations.

Crossing eliminations should proceed in an orderly, consistent manner.

Highways should be rerouted, where practicable, to avoid crossing railroads.

Stop making new crossings.

Railroad crossings should be clearly and uniformly indicated to the public.

The highway traveler's view of trains should be improved, where possible.

Proper warning should be given of the approach of trains.

Warning signals should be obeyed.

Where obligatory to stop before crossing railroad tracks, an ACTUAL STOP, plus observation, should be made.

Penalties should be imposed upon all who cross railroads recklessly.

LOOK and LISTEN.

Utmost care should be exercised by EVERY person at EVERY crossing.

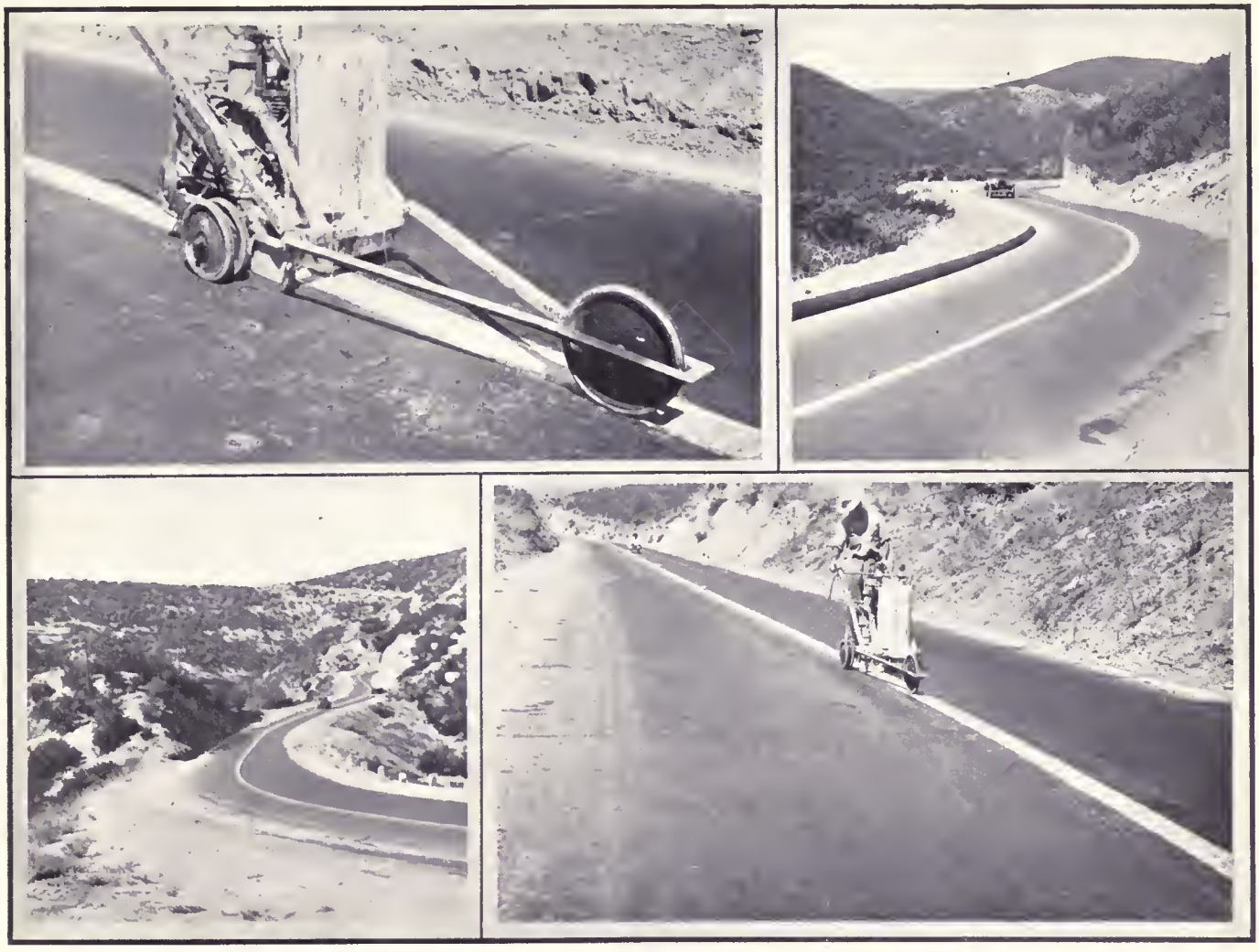
Help prevent accidents.

CROSS CROSSINGS CAUTIOUSLY.—American Railway Association.

COST OF ROAD TRAFFIC DELAY.

The utilization in 1924 of 418 miles of highway in Cook County, Illinois, was approximately 990,000 vehicle-miles per day. Assuming an average speed of 20 miles per hour, the daily vehicle-hours are 49,500. Assuming that each vehicle loses four minutes per hour due to traffic congestion on the county highways caused by natural or artificial obstructions or indirect routes, there is a daily time loss to traffic of 3300 vehicle-hours. Considering the number of persons per passenger car and the net load per motor truck the value of this lost time is at least $3 per hour. On this basis, there is a daily net loss, due to traffic delays, of $9,900 on these 418 miles of highway. Assuming this condition to exist 300 days during the year the annual loss is approximately $3,000,000.—From report on the highway system of Cook County, Illinois.

THE TRAFFIC LINE STRIPE ON STATE HIGHWAYS



TRAFFIC STRIPES—(1) Closeup view of the Simmons Traffic Line Paint Spray Machine. (2) Applying second coat of paint. Sonelac used to cover first coat of Bass-Hueter Traffic White. (3 and 4) Views showing white traffic center on the Ridge Route, near Los Angeles. The stripe is of great assistance to mountain driving.

Reported by W. A. SMITH, Assistant Maintenance Engineer.

THE MAINTENANCE Department of the Division of Highways has extended the use of the painted traffic stripe to establish traffic lanes on long stretches of our heavier traveled pavements. This device had previously been used on state highways at crossings, blind curves and on narrow bridges and the results were so satisfactory that it was felt justifiable to extend its use.

The painting of a stripe on the center of the pavement, on first thought, appears a simple operation, but careful and conscientious effort is required to secure a satisfactory job. A slight variation in the line is magnified amazingly to the critical eye, and on rough pavement with ragged edges a true uniform stripe is difficult to secure. Before starting the work a number of painting and marking devices were tried out, and the Testing Laboratory analyzed various brands of paints and made series of tests, resulting in the adoption of a standard specification and equipment. For pavements with uniform edges a wheel device with marker arm at the center of the pavement may be used. On other pavements, it is necessary to mark the line by measuring and lining in the center by means of a cable. The paint machine used is hand propelled, on which is mounted a small compressed air spray outfit.

The paint must work rapidly through the spray machine, spread uniformly, dry quickly without becoming chalky and should wear well. The specifications developed were for a comparatively cheap white paint which proved satisfactory on concrete pavements but was absorbed or broken down in a short time by asphaltic and oil types of surface. At present the department is using orange colored lacquer paint on the asphaltic surfaces. About ten gallons of paint are required per mile. Some 260 miles of six-inch traffic line have been painted. The cost varies from about $25 to $55 per mile. The average is about $38 per mile. This cost is higher than originally estimated but it is felt the work is well worth the expenditure. On one section of the asphaltic desert roads with oiled shoulders, traffic was unable to distinguish the edge of the pavement at night. This caused a number of serious

(Continued on next page.)

THE TRAFFIC LINE STRIPE ON STATE HIGHWAYS

(Continued from page 9.)

accidents as machines runing off into the sand were constantly in danger. The white center line now serves as a guide line and accidents have been materially reduced. In fog belts and on mountain roads, a good visible line gives a driver added assurance, as he watches the traffic line instead of the guard rail or edge of the pavement. The guide line tends, almost automatically, to hold traffic to the proper lane. It gives confidence to approaching drivers and permits of freer passing by fast machines, thus speeding up and safeguarding traffic.

Wrong Number!

"Why did Maizie lose her job in the office issuing automobile license plates?"

"They found out she was a telephone operator."

Going or Coming.

"No, sir," answered Cactus Joe. "This here is a growing community with expenses to meet. If we can't ketch a car for speedin', we ketch it for standing still."—Washington Star.

The Verdict.

The following was the verdict by an Iowa jury in a suit against a railroad company:

"If the train had run as it should have run; if the bell had rung as it should have rung; if the whistle had blowed as it should have blew, both of which it did neither—the cow would not have been injured when she was killed."—Erith Observer.

It Did.

Rastus and his wife, driving to town in their decrepit flivver, had parked it casually in the first available space. While they were away a traffic officer attached a numbered tag to the vehicle for parking in a prohibited zone. On their return, Rastus noticed the tag and was for throwing it into the street, but Rebecca restrained him.

"Sabe de ticket, honey," she said. "Dat number might win sumthin'."

Please, Teacher!

She was still rather new at driving a car and a little bit confused in traffic. Down Broadway she forgot to stop soon enough at the signal and shot out into the middle of the street.

Pompously the traffic officer bore down upon her.

"Didn't you see me hold up my hand?" he shouted fiercely.

The culprit gasped a breathless "Yes."

"Didn't you know that when I held up my hand it meant Stop?"

"No, sir; I'm just a school teacher," she said, in a timid, mouse-like voice, "and when you raised your hand like that I thought you wanted to ask a question."—New York Sun.

Hey! Teacher.

Bobby's father was a highway engineer. His teacher, failing to get a satisfactory answer from several in his class in the defining of "cement," sought Bobby's assistance and received the following reply:

"Cement is the product obtained by finely puverizing clinker produced by calcining to incipient fusion an intimate and properly proportioned mixture of argillaceous and calcareous materials with no addition subsequent to calcination except water and calcined or uncalcined gypsum."

STEP ON IT!

(An English auto racer in a specially designed Sunbeam has recently hung up a world's record of 207 miles an hour. It took him four miles to stop his car. At the present rate of progress, may we hope for something like the following in 1975?)

"Mother, George and I are going out to a dance."

"All right, dear. Don't be late, will you?"

"No, Mother. The party's in San Francisco. We'll be back early."

(The Modern Girl of 1975 kisses her mother goodnight and steps into her boy friend's 1200 horsepower runabout. He puts the car in low, and they thread through the traffic of lower New York at 40 miles an hour. Once in the country, George shifts to second speed and they amble along at a comfortable 138 per.)

"Hadn't we better slow up, George? That sign back there said 'Danger: Sharp Curve five miles ahead.'"

"That's all right, Joan. We have eight-wheel brakes. Well, here we are in Chicago!"

(He quickly adjusts the armor plate about his car, and they dash through the great city at 200 miles an hour, Joan manipulating the machine gun to ward off possible attacks.)

"Someone's trying to pass, George. He's been following us all through Iowa."

"Trying to pass, huh? Just let's see him do it!"

(With a whir of gears, George shifts into fifth speed and shoots ahead like a comet. The other car follows suit. Milestones whiz past in a confused blur as the Juggernauts skim over the countryside, wheels scarcely touching the road.)

"George! Look out! Here's a railroad crossing."

"Good gosh! The fool engineer! He's trying to beat me across."

(George jams on his brakes, but it is too late. There is a terrific smash. On the far side of the track, George finally comes to a stop and turns around. The wrecked Pacific Coast Flyer lies in a tangled mass across the rails, cars telescoped and splintered by the frightful impact. Beside the track, by the grim irony of fate, stands the warning signal which would have prevented this terrible accident: "Stop, Look and Listen; Look Out for the Automobiles!")

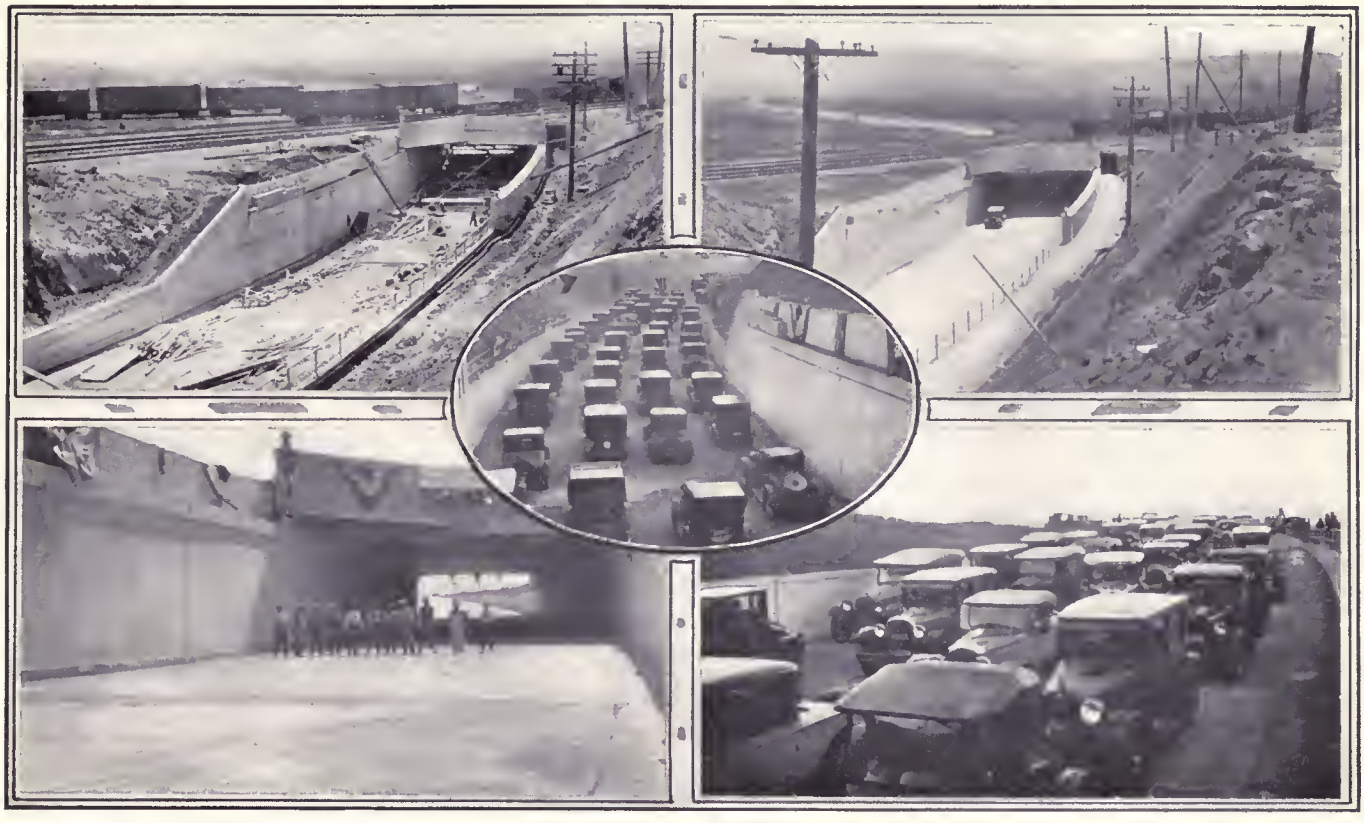
—Badger Highways.

AUTO VISITORS' NUMBERS INCREASE MONTH BY MONTH.

Nearly 100,000 persons entered California by automobile during August of this year, it is revealed in a report of the first actual count of passengers in automobiles crossing the state borders. A total of 99,657 passengers were counted in 33,572 motor cars entering the entire state during August, 1927. For the first time in history the number of passengers in the incoming tourists' cars were counted by officials at the various border stations under orders of the State Agricultural Department.

Since no check has ever been made heretofore on the number of persons that come into the state in automobiles, no comparisons can be made, but a substantial increase in the number of incoming automobiles is noted in the August figures for 1927 and 1926. During August of last year, 10,005 automobiles were counted entering over the transcontinental routes, as compared with 13,022 for the same month this year, an increase of more than 3,000 through the eastern boundary. A total of 26,433 cars were checked during August, 1926, into the entire state, but the figure was raised to 33,572 for August of this year.—Grizzly Bear.

California's Largest Underpass Opened to Traffic



SOUTH SAN FRANCISCO UNDERPASS—(1) Under construction. (2) Completed; note elevated sidewalk. (3) Ready for the opening ceremonies. (4) Traffic entering the pass on Lindbergh Day. (5) The big pass easily accommodates four lanes of traffic.

DESIGNATED as the largest structure of its type ever undertaken in California the underpass on the new Bay Shore highway at South San Francisco was thrown open to the public on September 16th. The opening was fittingly celebrated by a number of bay city and peninsular civic organizations cooperating with the Division of Highways.

This grade separation has been under construction for the past year by Barrett & Hilp, San Francisco contractors, with George W. Thompson as the Resident Engineer for the state.

Large Project.

The subway provides for a 40-foot roadway and an 8-foot sidewalk, passing under seven tracks of the Southern Pacific Company and the South San Francisco Belt Railroad. The deck is constructed to provide for one more track and the abutment walls have been built to provide for future extension of the deck to allow for five additional tracks. The length of the tunnel section of the subway is 190 feet with provision, as noted above, for an extension of 110 feet. The length from end to end of approach walls is 769 feet. The total length of paving laid under this contract is 1281 feet.

The total cost of the work done by Barrett & Hilp, contractors for the state, was $241,000. The Southern Pacific Company placed the falsework for supporting their tracks and did other track work totaling about $30,000. Approximately 1000 feet of 44-inch water main had to be moved and relocated. This work was done by the Spring Valley Water Company at a cost of approximately $9,000, making the total cost of construction $280,000, exclusive of engineering. Of this amount the Southern Pacific Company pays about one-fifth in accordance with a decision of the Railroad Commission.

Special Construction Features.

The roadway through the structure is 40 feet between curbs. There is an 8-foot sidewalk on the west side. The abutment on the east side is constructed to permit the building of an additional 40-foot subway at such future time as the present 40-foot width may become inadequate. The highway through the structure is on a curve with a radius of 1000 feet. The maximum grade of the approaches is 4 per cent. The approximate angle of crossing between the center line of highway and center line of tracks is 40 degrees, making the angle of skew 50 degrees.

On account of the large skew angle and also because yard tracks with switch points occurred over the structure, deck girders were used with span normal to the center line of roadway. Forty-two-inch plate girders spaced about 3-foot centers were used for the 42-foot span over roadway. Twelve-inch "I" beams at 18-inch centers were used over the sidewalk. The sides of the girders were encased in concrete and a 10-inch concrete deck was placed between the girders. The deck was covered with waterproofing and 15 inches of ballast placed thereon.

The low point in the subway was approximately 9 feet below ground water level and the bottom and sides up to this level were waterproofed with a 2-ply membrane waterproofing. Between abutments the pavement was reinforced against up-lift by spanning from abutment to abutment, a 25-inch pavement with 1¼-inch bars spaced 9- to 11-inch

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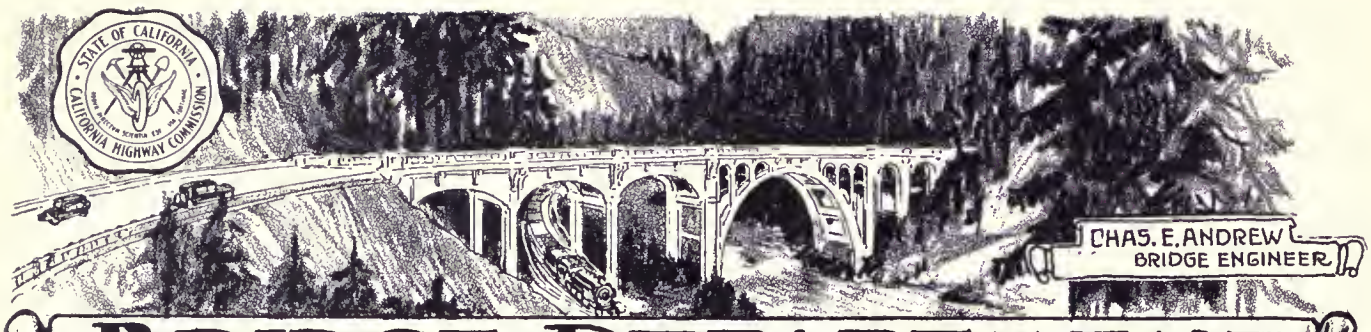


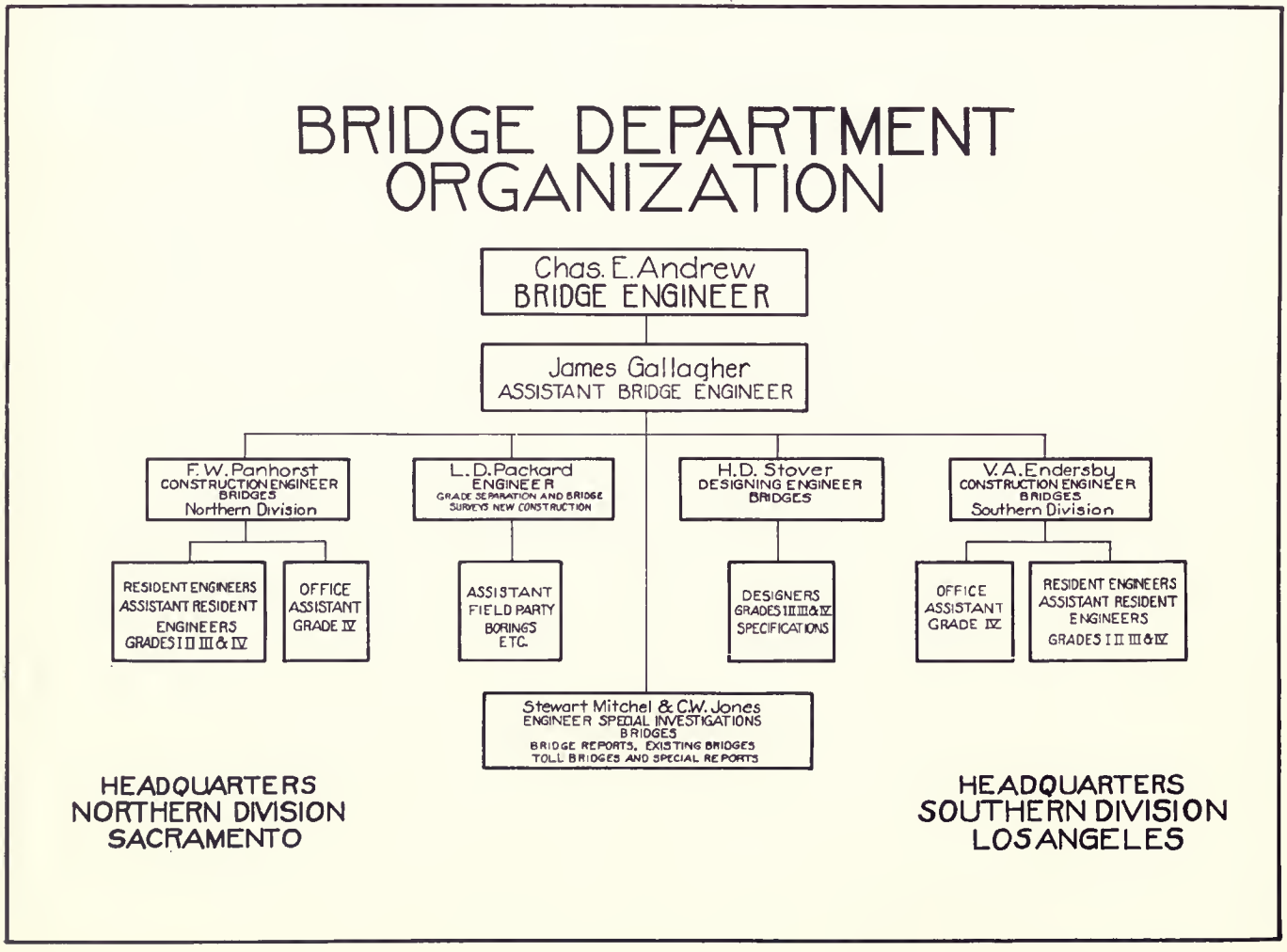
BRIDGE DEPARTMENT

BRIDGE DEPARTMENT ORGANIZATION

THE ACCOMPANYING is a diagram of the reorganized Bridge Department of the Division of Highways, as outlined by Charles E. Andrew, State Bridge Engineer. The divisions of the department and their respective duties have been clearly set forth, and in the general instructions issued by Mr. Andrew he has urged upon his staff the need of the utmost cooperation between the branches of his department and with the other departments of the Division of Highways.

Two State Divisions.

For the purpose of designating the territories over which the respective construction engineers shall have jurisdiction


BRIDGE DEPARTMENT ORGANIZATION
Chas. E. Andrew
BRIDGE ENGINEER
James Gallagher
ASSISTANT BRIDGE ENGINEER
F. W. Panhorst
CONSTRUCTION ENGINEER BRIDGES
Northern Division
L. D. Packard
ENGINEER
GRADE SEPARATION AND BRIDGE SURVEYS NEW CONSTRUCTION
H. D. Stover
DESIGNING ENGINEER BRIDGES
V. A. Endersby
CONSTRUCTION ENGINEER BRIDGES
Southern Division
RESIDENT ENGINEERS ASSISTANT RESIDENT ENGINEERS GRADES I II III & IV
OFFICE ASSISTANT GRADE IV
ASSISTANT FIELD PARTY BORINGS ETC.
DESIGNERS GRADES III III & IV SPECIFICATIONS
OFFICE ASSISTANT GRADE IV
RESIDENT ENGINEERS ASSISTANT RESIDENT ENGINEERS GRADES I II III & IV
Stewart Mitchel & C.W. Jones
ENGINEER SPECIAL INVESTIGATIONS BRIDGES
BRIDGE REPORTS, EXISTING BRIDGES TOLL BRIDGES AND SPECIAL REPORTS
HEADQUARTERS NORTHERN DIVISION SACRAMENTO
HEADQUARTERS SOUTHERN DIVISION LOS ANGELES

and for facilitating their duties, the state has been divided into two districts, designated the Northern District and the Southern District. The Southern District comprises the counties of San Luis Obispo, Kern, Mono, Tulare, Inyo, Santa Barbara, Ventura, Los Angeles, San Bernardino, Orange, San Diego and Imperial, with headquarters at Los Angeles. The remainder of the state comprises the Northern District, with headquarters at Sacramento.

Assistant Bridge Engineer.

The Assistant Bridge Engineer must be conversant with all matters pertaining to the design and construction of all bridges so as to be able to assist the Bridge Engineer and to act in his place during his absence. While thus empowered he must at all times confer with the Bridge Engineer in matters of major importance involving policy, change of plans, construction of all bridges so as to be able to assist the Bridge Engineer in matters of major importance involving policy, change of plans, expenditure of money, etc. All mail of the department must pass through the assistant's office and all mail and reports originating in the department must pass over his desk. He shall have full charge of the opening of all bridge bids and all necessary detail, keeping a systematic record of same and keeping close touch with the right of way department.

Designing Engineer.

The Associate Bridge Engineer, Designs, shall report to the Bridge Engineer through the Assistant Bridge Engineer. He has charge of the design of all structures, all designers, draftsmen, computors and specification writers reporting to him. He must keep a record of all their work and is to be held responsible for correctness, adequacy and cost of design. Before proceeding with designs he must have complete reports on all building sites. He must personally sign all plans and submit same for final approval to the Bridge Engineer. All plans must be signed by the State Highway Engineer.

Grade Separations and Bridge Surveys.

Engineer, Grade Separations and Bridge Surveys, shall be the title of the head of this branch. He shall have charge of the securing of all preliminary data and information necessary for the Designing Engineer and also of all necessary negotiations with railroad companies regarding the joint construction of grade separations. To expedite proceedings he must keep in close touch with the right of way department and district engineers.

Construction Engineers.

The Construction Engineers shall have full charge of the construction in their respective districts after the contracts are awarded and shall be held responsible for the proper prosecution and completion of all work. They shall have complete charge of resident engineers.

Engineer, Special Investigation.

The Engineers, Special Investigation, Bridges, are charged with making a complete survey of the bridges in the state system and to make reports on any special work that may be assigned to them, rendering frequent reports and data to the Bridge Engineer.

CARQUINEZ BRIDGE INCREASES TRAFFIC.

The traffic over Carquinez Bridge for the period of May 20th to August 31st, this year, as compared with the ferry traffic for the same period via the Vallejo-Rodeo Ferry last year, showed an increase of 87 per cent. Cars over the bridge carry an average of 2.6 passengers.

CALIFORNIA'S LARGEST UNDER-PASS OPENED TO TRAFFIC

(Continued from page 11.)

centers being required. Beyond the abutments, where the character of the subgrade permitted, the pavement was anchored by ¾-inch dowel anchors spaced 42- by 54-inch centers and grounded 42 inches into the rock. Tests were made of these anchors to determine if the subgrade was sufficiently strong to develop the full strength of the dowel. The anchor pavement varied from 12 to 18 inches in thickness and was reinforced with ½-inch bars and wire mesh. At the south approach the subgrade changed to a blue clay and mud and anchors could not be used. Here a gravity pavement varying from 33-inch to 12-inch above the waterproofing was used. Transverse construction joints through pavement and walls were made about every 30 feet. Copper strips were placed in all construction joints just below ground water level.

Falsework for supporting tracks was placed by the Southern Pacific forces. Excavation was handled in a very efficient manner, the equipment consisting of 3 steam shovels and 10 5-yard dump trucks. The excavation was kept dry by pumping. A 3-sack mixer was used in making concrete for structure and pavement. As the railroad company found it impractical to operate on less than 4 tracks for any length of time it was necessary to carry traffic over girders soon after the deck was poured. Quick hardening aluminum cement, which attains its full strength in 24 hours, was therefore used in the deck. Six hundred and sixty barrels of this cement were used.

Forerunner of Further Construction.

The opening of this structure is the forerunner of much future construction for the Bay Shore highway. At present, a distance of 5.24 miles south of the underpass is graded to a width of 120 feet. The Highway Commission has allocated $150,000 for its rock surfacing and oiling and an additional $180,000 for further construction south of San Mateo. These funds will be available upon the collection of the first quarter of the new 1-cent gas tax, or about December 1st, this year.

ARKANSAS GAS TAX RAISED TO FIVE CENTS.

Each week sees one or more states increasing the gasoline tax rate. Arkansas is the latest, the rate being boosted from four to five cents. This makes four states that collect a nickel a gallon for road purposes.

Laugh That Off.

"Hello, Hayseed," said the facetious youth. "How's it for a lift to Centerville?" He jumped into the car without waiting for an answer.

Twenty minutes passed.

"Quite a distance to Centerville, isn't it?"

"Uh, huh."

Twenty minutes more.

"Say, how far is it to Centerville?"

"Few thousand miles if you go this way; 'bout twenty if you get off and walk back."—Selected.

Rather Harsh.

A man is something that can see a pretty ankle three blocks away while driving a motor car in a crowded city street, but will fail to notice, in the wide, open countryside, the approach of a locomotive the size of a school house and accompanied by a flock of forty-two box cars.

WHAT THE DISTRICTS ARE DOING

DISTRICT VI.

HEADQUARTERS, FRESNO.

E. E. WALLACE, ACTING DISTRICT ENGINEER.

Counties of Fresno, Madera, Merced, Mariposa, Kings, Tulare, and Kern, north of the Tehachapi.

Convict Camp at Work on New Location.

The convict camp formerly stationed at Bloss on the Merced-Yosemite All-Year highway, has been transferred to Mid Pines, approximately six miles north of Mariposa. The camp has been established and two steam shovels are to be used in improving alignment between Mariposa and Briceburg.

Kern County Reconstruction.

Force, Currigan and McLeod are at work on the resurfacing and widening work between Lerdo and Famosa, under Contract 96FC1.

The Valley Paving Company of Visalia located their asphalt plant at McFarland for reconstruction of pavement between a point one mile south of Delano and Famosa. This work is under Contract 96FC2.

DISTRICT VII.

HEADQUARTERS, LOS ANGELES.

S. V. CORTELYOU, DISTRICT ENGINEER.

Counties of Los Angeles, Ventura, Orange, San Diego, and eastern Kern, south of Mojave.

Reconstruction in Orange.

George Herz and Company of San Bernardino are at work on the reconstruction of 5.7 miles of state highway in Orange County, between Galivan and Irvine. The new work provides for a 40-foot graded roadway and a 20-foot concrete pavement with two-foot rock borders.

The construction of rock borders along the recently completed pavement on the La Mesa to El Cajon reconstruction job in San Diego County is rapidly nearing completion.

Ventura Seawalls Completed.

The construction of pavement and seawalls has been completed on the Coast highway reconstruction job, between Ventura and the Santa Barbara County line. Work is now in progress on the placing of rock borders adjacent to the new pavement and the construction of sidewalks and curbs back of the sea walls.

Two State Highways Linked By New Construction.

Good progress is being made on the connecting link between Route 60 and Route 2, across the San Juan Creek flat in Orange County, near Serra. Two bridges are under construction, grading a mile of highway is in progress and the Santa Fe Railroad Company is constructing two bridges that will carry their trucks over the new state highway.

District VII Save Maintenance Buildings.

The Ridge route in Los Angeles County was recently the scene of one of the worst fires that has been experienced in the southern part of the state. The fire burned for eight days laying waste to an area of about 21,000 acres.

Both the Liebre Maintenance Camp and Superintendent Mike Sullivan's construction camp had a close call. Back firing by the state crews and a fortunate shift of the wind was all that saved these camps from destruction.

Guard rail along the highway in several places was destroyed by the fire and stones and other debris loosened by the fire were strewn along the highway for miles.

DISTRICT X.

HEADQUARTERS, SACRAMENTO.

R. E. PIERCE, ACTING DISTRICT ENGINEER.

Counties of Amador, Calaveras, Alpine, Tuolumne, Stanislaus, San Joaquin, Solano, and southern Sacramento and Yolo counties.

Mother Lode Line Change.

A line change which was started last Fall on the Mother Lode highway between the Cosumnes River and Plymouth has now been completed and opened to traffic. This change was made along lines of standard construction with high grade alignment. Two very bad creek crossings were eliminated.

Non-skid Pavement.

In order to make the highway between Fairfield and Putah Creek north of Dixon safer for travel during the winter months, all the asphaltic concrete was thoroughly disked with a Killifer road disc in order to remove all the excess asphalt and expose the rocks in the mix to make the pavement non-skid. This work is now completed.

Center Traffic Line Increases Safety.

A center strip has recently been placed on the Yolo Causeway, and the wheel guards painted white. This change seems to be very popular with the motorists using the causeway, as they claim it has made the bridge much safer for traffic, especially at night.

Amador Gets Oiling.

District X has recently completed its oiling program for the second half of the year. Most of the work during this period was in Amador County on Route 54 and the Mother Lode highway.

Sonora Pass Greatly Improved.

Superintendent Harris is doing splendid work on the famous Sonora Pass. This pass has always been considered one of the toughest in the Sierra Nevada Mountains. During 1926 this road was greatly improved and continued improvement this season has put it into a safe, travelable condition.

HIGHWAY NEWS NOTES

While Colonel Chas. M. Lindbergh visited Sacramento, A. M. Bass, of Headquarters Drafting Department, was a guest at a private luncheon in the airman's apartment at the Hotel Senator.

Thos. M. Joyce, foreman, has recently been transferred from District X to District I.

AUSTRALIAN VISITOR STUDYING CALIFORNIA HIGHWAY SYSTEM.

H. C. Rees of Lake Boga, Victoria, Australia, was a recent visitor at the central office of the Division of Highways. He is making a study of California irrigation and highway systems.

Helping Pop.

The minister raised his eyes from the notes of his sermon just in time to see his young son in the gallery pelt the congregation with horse chestnuts. The good man was preparing a frown of disapproval when the young hopeful cried out: "You 'tend to your preaching, Pop; I'll keep 'em awake."

SUBJECT TO FEDERAL AID—California has 4,467 miles of highway, all but 80 of which are also included in our State Highway System, for which federal aid funds can be obtained. This is known as the "Seven Per Cent System," or 7 per cent of the mileage of all existing roads of record in the state.

The Division of Highways during the 78th fiscal year, July 1, 1926, to June 30, 1927, received the sum of $2,978,864.97 from the federal government for new construction on the state's federal aid highways.

STATE HIGHWAY FUND CONTRACTS (Bond Funds, Including Federal Aid)

Cont. No.	District	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE SEPT. 2, 1927.						
525	VII	Los Angeles-Orange	60	E, A	Naples to Anaheim Bay Bridge	1.50	Portland Cement Concrete Pavement	Matich Brothers	$59,427 56	June 1, 1927	

NOTE.—Primary construction covered by the above contracts does not include funds obligated on cooperative forest highway projects, prison camp road activities, or day labor jobs not being done under contract.

STATE HIGHWAY MAINTENANCE FUND CONTRACTS (Including Gasoline Tax Fund)

Cont. No.	District	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
					COMPLETED AND ACCEPTED SINCE AUGUST 28, 1927.						
M-124	V	San Benito	22	A	Between San Juan Bautista and Hollister	6.90	P.C.C. Widening and Bit. Mac. Surface	Granite Construction Co.	$155,145 60	May 7, 1926	
M-148	IV	San Mateo	2	A	Between Colma and Cypress Lawn Cemetery	1.51	Grading	Kaiser Paving Co.	128,262 24	Oct. 7, 1926	
M-149	IV	Contra Costa	14	B	Between El Ciervo and Valona	1.78	Grading and Rock Surfacing	Tieslau Brothers	211,522 77	Oct. 12, 1926	
M-160	VI	Kern	4	D	Kern River Bridge at Bakersfield		Sidewalk and Approaches	Peterson and Eissler	8,413 31	Mar. 9, 1927	
M-169	VII	Orange	60	A	Santa Ana River		Cleaning and Painting Bridge	W. M. Ledbetter and Co.	3,183 75	June 1, 1927	
M-163	VII	San Diego	12	A, B	Between La Mesa and El Cajon	3.70	Grading and P.C.C. Pavement	George Herz and Co.	154,223 57	Mar. 9, 1927	
					AWARDED SINCE SEPTEMBER 2, 1927.						
93EC3	III	Colusa	7	B, C	Williams to Delevan	11.80	Construct Rock Borders	Hemstreet and Bell	$38,953 12	Sept. 16, 1927	90
911EC8	III	Glenn	7	B	Across Wilson Creek		R.C. Girder Bridge	Germain and Nickles	8,032 22	Sept. 30, 1927	100
94EC3	IV	Alameda-Santa Clara	5	C, A	Between Warm Springs Junction and Milpitas	4.40	P.C.C. Paving and Asphalt Conc. Surf.	Allied Contractors, Inc.	165,627 99	Sept. 30, 1927	125
95FC2	V	San Luis Obispo	2	E	Between Pismo and San Luis Obispo	9.70	P.C.C. and Bituminous Mac. Pave.	J. F. Knapp	451,393 21	Sept. 30, 1927	275
98FC1	VIII	San Bernardino	26	B	Redlands to one-third mile north of Riverside County line	4.80	Grading and P.C.C. Pavement	Matich Brothers	180,455 42	Sept. 30, 1927	150
					Total State Highway Maintenance Fund Contracts Awarded	30.70			$844,461 96		

NOTE.—The above obligations charged against the State Highway Maintenance Funds do not include funds from these sources obligated for general maintenance and for specific betterments being done under day labor authorization.

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